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# EXCAVATING ENGINEER

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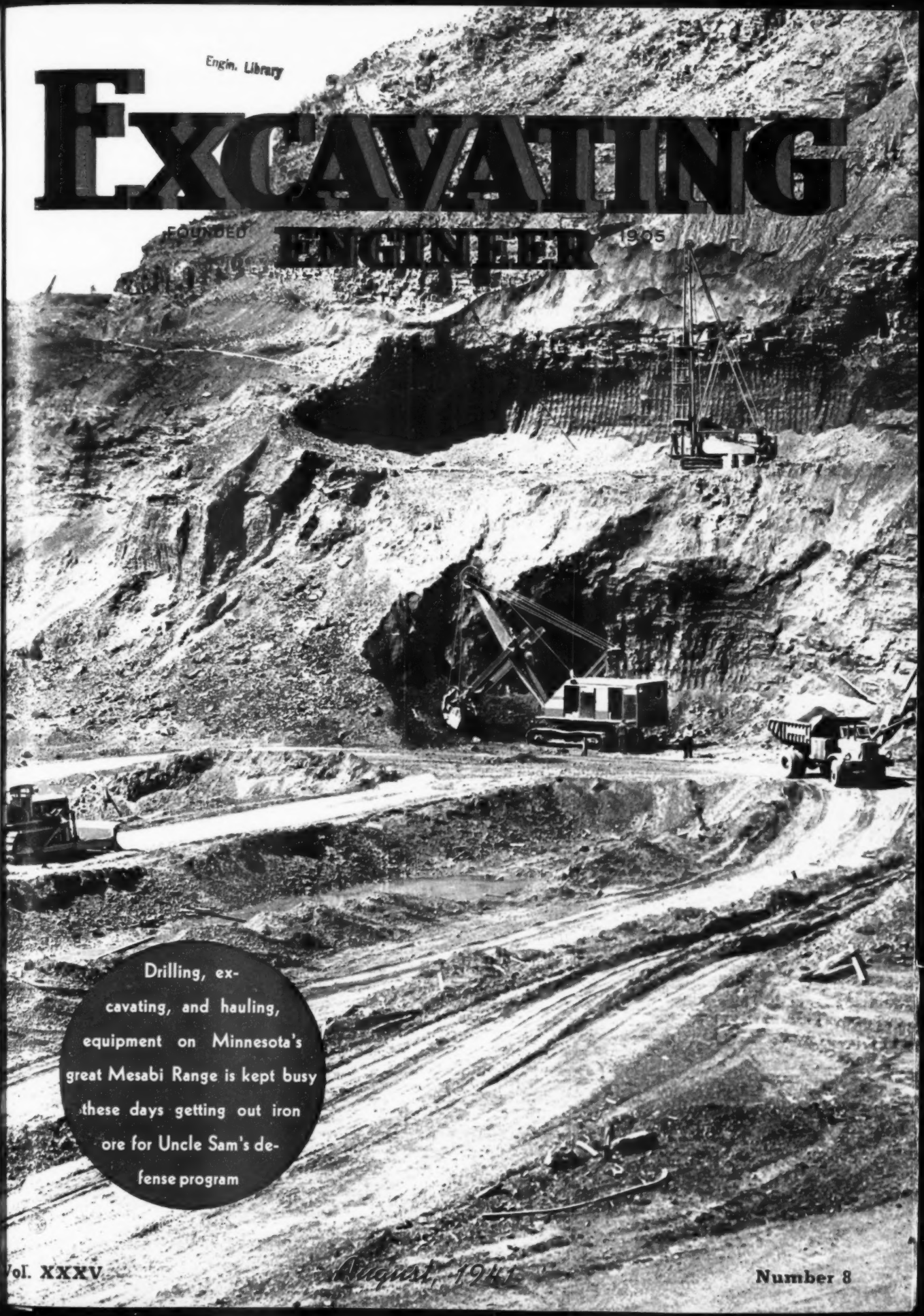

Drilling, excavating, and hauling, equipment on Minnesota's great Mesabi Range is kept busy these days getting out iron ore for Uncle Sam's defense program

Vol. XXXV August, 1941 Number 8

# TO MAKE A CRADLE OF THE DEEP ROCK

STONE quarried by Bucyrus-Eries owned by Guy F. Atkinson Company, George Pollock Company is extending the breakwater at Long Beach, California, to provide berth space for the entire Pacific Fleet. Two quarries: one on Catalina Island, and one at Riverside, are furnishing the two types of required rock. At Riverside, two 9-inch Bucyrus-Erie drills prepare the granite for blasting, and a 5-yard Bucyrus-Erie handles loading of 10-to-20-ton rocks. Type B rock at Catalina is loaded by two $2\frac{1}{2}$-yard Bucyrus-Eries.

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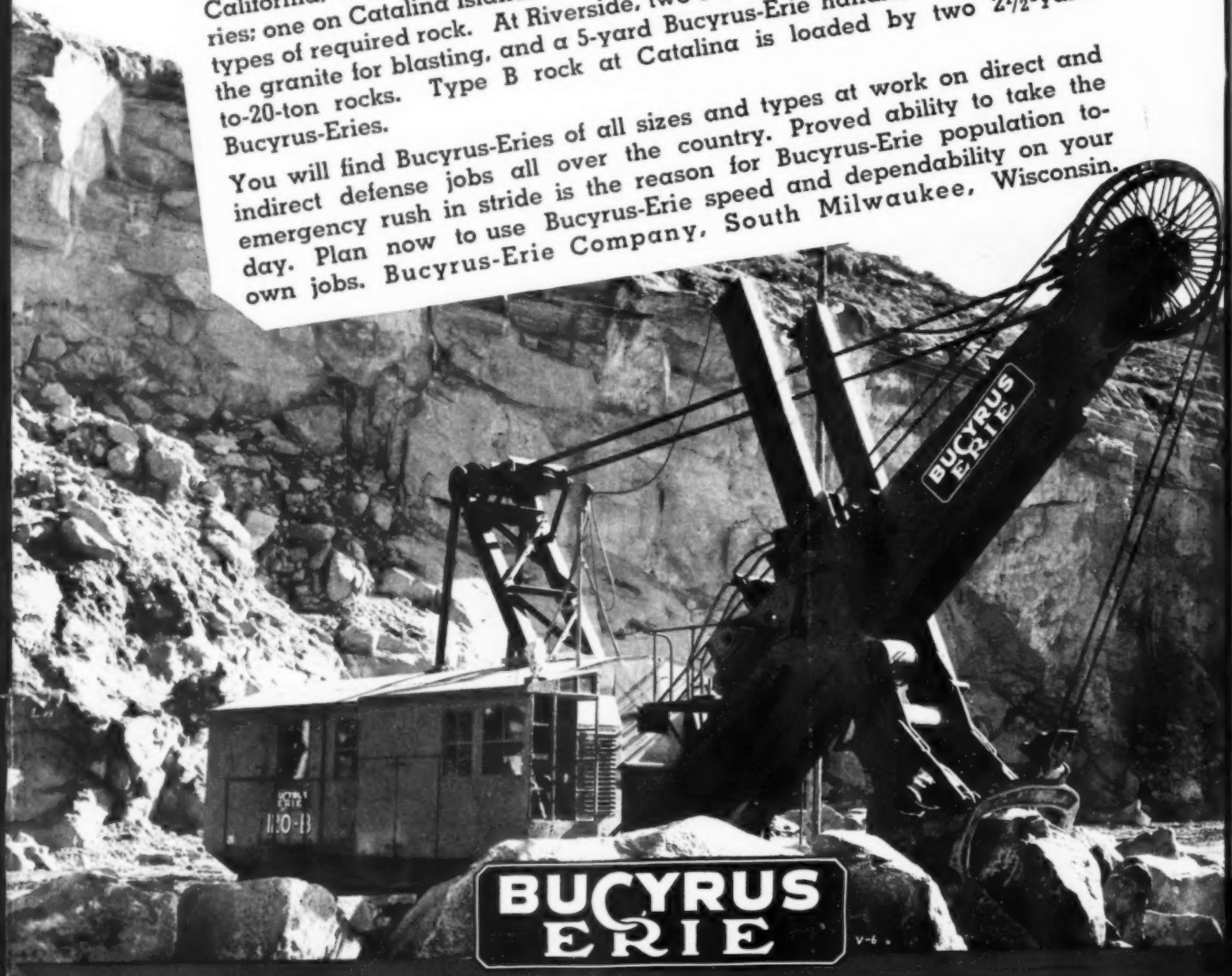


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EXCAVATING, DRILLING AND MATERIAL HANDLING EQUIPMENT

THE GROUNDWORK OF DEFENSE

# EXCAVATING ENGINEER

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**Front Cover**

The majority of iron ore for Uncle Sam's defense program comes from the open pit mines of Minnesota's Mesabi Range. Here a 2½-yard Bucyrus-Erie electric shovel has just finished loading a Dart truck which is hauling on a road serviced by a 'dozer-equipped Caterpillar tractor. On the ledge above a Bucyrus-Erie 27-T blast hole drill puts down hole for the next shot.

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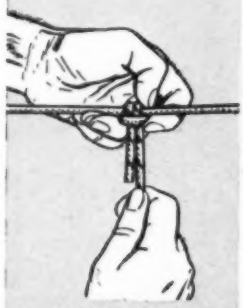
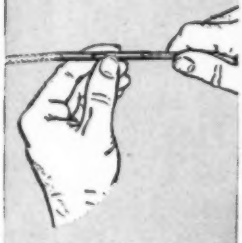


2. Half hitch branch to main line.

3. Connect main line lengths with square knot.



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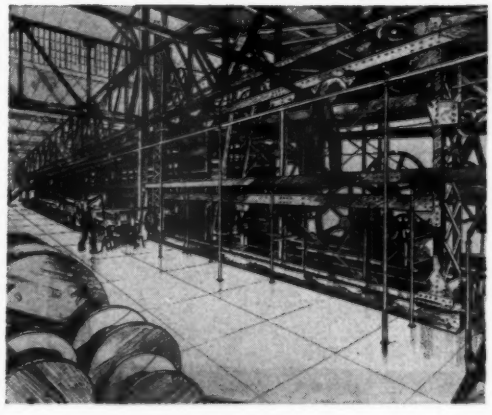

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EXCAVATING ENGINEER
AUGUST • 1941

# Moving Dirt —at a Profit

**E. W. Foley, Inc., uses two 4-wheel scrapers to handle 54,000 yards of dirt for the approaches of a bridge the company is building across the New York State Barge Canal near Rochester**

By Spencer Jones

ABOUT FIVE and one half miles southeast of Rochester, New York, E. W. Foley, Inc., a Brooklyn, New York, contractor is putting the finishing touches on a bridge across the New York State Barge Canal.

Although the scheduled completion date is December 1, 1941, the contractor is well ahead of schedule, as 70% of the job was already completed when it was visited in mid-April.

There's always a good reason, or several good reasons, why a contractor winds up a job with plenty of time to spare—good planning, intelligent supervision, good workmen, well-chosen equipment and lucky breaks. In this case, the contractor had all except the lucky breaks, but he didn't have any bad luck, either.

Before we go any further, let's give the job its official name and address. It is Federal Aid Project No. 308 (3), the reconstruction, with Federal Aid, of a portion of the Monroe Avenue State Highway No. 94 (more widely known as touring route No. 31) for a length of 0.21 miles, and a portion of the Pittsford Village (Monroe

• **Left, top: Ten yards of borrow rolls on its way to the bridge approach fill area in a Bucyrus-Erie scraper towed by an International tractor. Left: Foley Construction Company's 12-yard Emsco scraper picks up a load of borrow in the tow of a Cletrac tractor. Below: Bridge approach fill is compacted with a Bucyrus-Erie double-drum tamping roller hitched to an International TD-40.**

and South Main Streets) State Highway No. 5435 for a length of 0.21 miles. The preceding short lengths of highway reconstruction are the approaches to a through truss steel bridge of 240-foot span and two 65-foot steel plate girder approach spans across the New York State Barge Canal. The new bridge is a part of the Foley contract, as are also the paving of the highway approaches, bridge and approach spans with a 42-foot width of reinforced concrete for 4-lane traffic, and the demolition and removal of an existing steel truss bridge across the Barge Canal, as well as two old reinforced concrete approach spans with their piers and pedestals. The contract is F. A. R. C. 40-77.

Now that the official stuff is out of the way, we can talk about how E. W. Foley, Inc., made such good time building a bridge and moving pay dirt—and also managed to hang on to a little profit out of the job.

### Comparison of Job Estimates and Prices

Since prices and profits are somewhat related to each other, it should be interesting to compare some of the preliminary estimates of the engineers of New York State's Department of Public Works, Division of Highways, with the bid prices of the contractor. A table of these prices is shown above.

The state's engineers estimated that the total cost of the job would be $261,421. The contract was let at a total bid price of $235,549. Take a look at the estimated and bid prices for unclassified excavation and you will see a little difference of $15,536, enough difference to land the job for E. W. Foley, Inc. So, as usual, the successful bidder faced the problem of making a fair profit on a job which competitors were sure was figured too low to leave any profit.

The contract was awarded, and work started officially in November, 1940, the first job being to drive the seamless steel pipe piles to support the piers and abutments of the new bridge and approach spans. With freezing weather, canal traffic stopped and the contractor worked three 8-hour shifts per day driving piles with a 42-B Bucyrus-Erie steam crane holding a Vulcan No. 1 pile driving hammer at the end of its 65-foot boom.

The specifications stipulated that the 240-foot bridge span must be erected for the opening of the canal navigation season as determined by the commissioner of canals. Since the opening of navigation depends on the weather, and varies from early in March to late in April, the contractor was forced to schedule completion of the truss span by March 1, as no false work or other obstructions would be permitted to remain in the canal after the boats started running.

### Removing Pile "Biscuits"

One of the major problems at this stage of the work was the

**Estimated and Bid Prices of E. W. Foley Contract**

| Quantity | Measure | Item | Unit Price Est. | Unit Price Bid | Total Price Est. | Total Price Bid |
|---|---|---|---|---|---|---|
| 63,600 | c.y. | Unclassified Excavation | $ .45 | $ .19 | $28,620.00 | $12,084.00 |
| 3,502 | c.y. | Trench, Culvert and Bridge Excavation | 1.50 | 1.50 | 3,502.50 | 3,502.50 |
| 370 | l.f. | 12" Vitrified Sewer Pipe | 1.15 | .75 | 425.00 | 277.50 |
| 700 | l.f. | 6" underdrain | .35 | .30 | 245.00 | 210.00 |
| 380 | l.f. | Special Reinforced Concrete Pipe | 2.00 | 2.00 | 760.00 | 760.00 |
| 7,430 | bbls. | Portland Cement | 2.35 | 2.58 | 17,460.50 | 19,169.40 |
| 425 | c.y. | Concrete for Structures | 18.00 | 17.00 | 7,650.00 | 7,225.00 |
| 1,679 | c.y. | First Class Concrete | 13.00 | 12.00 | 21,827.00 | 20,148.00 |
| 140,090 | lbs. | Bar Reinforcing Steel for Structures | .055 | .055 | 7,704.95 | 7,704.95 |
| 1,345,000 | lbs. | Structural Steel | .07 | .066 | 94,150.00 | 88,770.00 |
| 2,326 | c.y. | Cement Concrete Pavement | 4.75 | 4.75 | 11,048.50 | 11,048.50 |
| 9,200 | l.f. | Steel Pipe Piles— 12" x 3/8" Seamless | 3.10 | 3.00 | 28,520.00 | 27,600.00 |
| Lump Sum | | Coffer Dams, Pump, Bail and Drain | | | 4,400.00 | 4,400.00 |
| 2,950 | l.f. | Precast Concrete Curbing | 1.05 | 1.00 | 3,097.50 | 2,950.00 |
| 500 | c.y. | Run of Bank Gravel Foundation Course | 2.25 | 1.50 | 1,125.00 | 750.00 |

• Left: General operations view of the Foley bridge contract showing grading and tamping work in the foreground. In the background the Link-Belt truck crane erects steel on the new bridge. The old structure is at the right. Right: A big load gets an uphill shove as a Bucyrus-Erie 'dozer mounted on an International TD-40 rough grades the west approach.

• Presenting the people behind the Foley bridge contract: (L to R) Charles Blair, steel engineer; Fred Burke, steel foreman; James Dempsey, assistant superintendent; Miss Marian Foley, contractor's engineer; Miss Alice Foley, timekeeper; Sidney Towe, resident engineer; Frank W. Foley, general superintendent.

cleaning of the interior of the pipe piles, which were to be filled with concrete after driving. Each pipe contained a "biscuit" of earth which plugged it for a length of 10 to 20 feet from the bottom. The solution was as simple as it was effective, pour in a lot of water; churn the mixture of earth and water into a thin gruel; at intervals blow the gruel out of the pile by means of an air jet fastened to the churn; finally, pour in some fresh water and blow it out the same way for a rinse.

So the pipe piles were driven, cleaned and filled with concrete. Then the pier and abutment forms were built and the concrete poured into them after having been mixed in a Koehring 27-E, gas-powered, 1-yard mixer. Here, too, there was the problem of winter protection for the concrete, for during the pouring of the pier and abutment concrete the weather was uniformly cold and snowy. The contractor's answer was to build a housing around each pier and abutment; cover the housing framework with canvas and heat the interior with coke-burning salamanders. All the concrete came through the cold weather in perfect condition.

Winter also handed E. W. Foley, Inc., another difficulty, the question of what to use for the fluid weight in a Bucyrus-Erie TDO-96 double-drum tamping, or sheepsfoot, roller. In warm weather, water ballast would have been satisfactory for the 1,800 lbs. of fluid ballast per drum needed to provide the approximately 200 lbs. per square inch pressure under the renewable feet. Any one of various anti - freeze solutions could have been added, but the contractor didn't wish to take any chance on corroding the interior of the drums, so he had them filled with used crankcase oil, reducing the ballast weight per drum to about 1,600 lbs., and the pressure per square inch under the renewable feet to about 180 lbs. per square inch. Needless to say, there was no freezing trouble here, and the approximate 10% loss of weight was a small price to pay to avoid burst drums or corroded interiors, according to the contractor.

As indicated by the fact that a tamping roller was used during the winter, excavation was carried on even though the earth was occasionally frozen too hard and deep to make the job very easy. Fortunately, rocks and boulders are comparatively rare in this area, which was once, according to physiographers, the bottom of a considerably larger Lake Ontario.

### 54,000-yard Job For Scrapers

Aside from the comparatively small yardage of excavation for bridge piers and abutments and culvert trenches, the major portion of excavated material was used for fill to construct the ramps which brought the relocated highway up to the level of the new bridge. The bottom of the new bridge being eight feet higher above the canal water level than that of the old bridge, and the new bridge being four lanes wide while the old bridge was only two lanes wide, made it necessary to provide about 50,000 cubic yards of fill for the west approach ramp and 4,000 cubic yards for the east approach ramp.

This yardage was practically all borrowed from a gentle slope of sandy loam, covering several leased acres about 980 feet, average, from the west approach. Depth of excavation in the borrow was limited by the need to provide adequate drainage while maintaining a downgrade for loading a Bucyrus-Erie 8-yard, struck measure (10-yd., heaped), 4-wheel S-90 scraper, pulled by an International TD-18 diesel-powered tractor, and a 12-yard 4-wheel, Emsco ES-12 scraper, pulled by an FGC Cletrac gas-powered tractor.

The reasons for using 4-wheel, tractor-drawn scrapers instead of a shovel and trucks were (1) the shallowness of practical excavation in the borrow, which would have kept a shovel moving constantly from spot to spot; (2) the fact that fewer men were required to load, haul, dump and spread with tractor-drawn scrapers than would be required with loading equipment, hauling - dumping equipment and separate spreading equipment.

In other words, here was an ideal situation for tractor-drawn scraper operation, and certainly pay dirt at a profit was essential to make up for that $15,536 difference between estimated and actual bid on unclassified excavation.

A general recapitulation of the factors involved is as follows:

Average Haul—980 feet.
Type of Earth—Sandy loam.
Average Grade of Haul—
- 4% downgrade for loading.
- 2% upgrade for 300 ft. haul.
- 1% upgrade for next 300 ft.
- 7% upgrade for next 200 ft.
- 4% upgrade or downgrade on fill for 180 ft., depending on where dumped.

Ground Conditions for Hauling—Usually firm except on untamped part of fill.

Amount of Borrow Dirt Needed for Fill —57,400 cu. yds.

Maximum Average Depth of Excavation in Borrow—3 feet.

Area of Borrow Actually Excavated—75,000 sq. ft.

The power of both tractors was adequate for loading and hauling, so no pushing was needed. The Bucyrus-Erie scraper, drawn by the International tractor, loaded in a little less than 60 seconds (0.99 minutes to be exact), and traveled an average of 90.5 feet to load. The loads were all well heaped and usually came to 10 yards. The Emsco scraper, drawn by the Cletrac tractor, loaded 11 to 12 yards in a little more than 70 seconds (1.17 minutes to be exact again), and traveled an average of 102.3 feet to load.

### Scraper Time Study

Hauling time for the Bucyrus-Erie-International unit, including a 90° right hand turn as the scraper finished loading and another 90° right hand or left hand turn before dumping on the fill, was an average of 3.45 minutes. Dumping and spreading time varied from .75 minutes when dumped going up grade on the fill to .45 minutes when dumped going down grade. Each 90° turn between loading and dumping took .1 minutes to .2 minutes, depending on ground conditions and available space.

Hauling time for the Emsco-Cletrac unit, operating under identical conditions, was an average of 4.1 minutes. Dumping and spreading time under the same conditions varied from .81 minutes on an uphill dump to .62 minutes on a downhill dump. Each 90° turn between loading and dumping took .13 minutes to .24 minutes, depending on ground conditions and available space.

Returning time, including a 90° turn at the end of the dumping spread and another 90° turn before the beginning of the loading, was 2.95 minutes for the Bucyrus-Erie-International unit and 3.52 minutes for the Emsco-Cletrac.

This made a time cycle of 8.14 minutes, maximum, and 7.84 minutes, minimum, with an average of 7.99 minutes per cycle for the Bucyrus-Erie-International unit. The cycle for the Emsco-Cletrac unit was 9.6 minutes, maximum, and 9.41 minutes, minimum, with an average of 9.50 minutes. The difference between maximum and minimum cycle lengths was due to the fact that allowance was made for uphill or downhill dumps in timing the units.

• The Foley bridge contract was a natural for scraper use. This Bucyrus-Erie 4-wheel unit hauled its share of the 54,000 yards moved.

A comparison of the costs of shovel-truck-bulldozer operation compared with scraper-tractor operation on this job shows the advantage of employing scrapers on this type of a job. The digging was so shallow that a shovel would hardly be spotted before it would have had to move to a new location. A shovel operator would be needed at a minimum wage of $1.50 per hour as well as an oiler at 85c per hour. At least three 5-yard dump trucks would be needed, with drivers getting a minimum wage of 65c per hour. A tractor and bulldozer would be needed for spreading, with the operator getting a minimum of $1.00 per hour. And these six men probably could not have handled any more pay dirt than two scraper-tractor operators at $1.25 per hour, each, under the circumstances—which makes the scraper-tractor method obviously the better one from a standpoint of labor costs, alone.

•Partner in the Foley two-scraper team, the 12-yard Emsco scoops up a load of fill for the new bridge approaches.

### Erecting the Steel

Simultaneously with the building up of the highway approach ramps, the steel truss bridge was being erected, by the contractor's own force, following the proper

*(Continued on page 490)*

# Getting the Most Out

**Mr. Copley, a lubricating consultant, points out how correct diesel fuel usage will help your diesel engines pay dividends in higher power output, dependable service, and lower maintenance costs**

By C. J. COPLEY
Lubricating Consultant

THE MOST DIFFICULT lesson the diesel engine owner or operator has had to learn during the past few years is that his engine is only as efficient as the fuel it burns and only as dependable as the oil that lubricates it. When the diesel engine was first introduced to this country as a power producing mechanism, the over-enthusiasm of those responsible for its promotion, resulted in the creation of a reputation it has never been able to live up to.

The main selling argument for the diesel engine, included in every sales promotional brochure, was the heavily underlined claim for cheaper power production. Electrical energy could be produced at half the cost of production by steam. Machinery would be made to turn at a fraction of present costs. All through the sales talk ran the theme of low charges for doing work. It was a theme that found open ears and a ready acceptance.

Since most of us were unfamiliar with the diesel back in that era, we wanted to know how this cheaper power was to be produced. We knew the theory of the engine. We knew it developed its own combustion cycle and needed no ignition device. We knew the diesel was functioning in foreign areas, and we were wide open for giving it a trial as a power producing engine in this country. But, how was the cost of the horse power going to be cut to practically nothing?

The answer was simple enough. The diesel engine would consume only cheap fuels! Using the cost of gasoline as a base figure, the fuel suitable for the diesel was only one fourth. We were given to understand that the cheaper the fuel, the better the engine liked it. The diesel engine, as a matter of fact, could even burn coal dust! In a pinch diesels could be operated on saw-dust! Experiments have even been conducted where the diesel had operated on powdered milk! Low cost fuel was the selling appeal.

Thus the diesel engine got off to its start in this country on the premise that it would burn about most anything that could be forced

• **Below: Compressed air to drive two wagon drills and four jackhammers at the State of Alabama's aggregate plant near Bangor is furnished by a Caterpillar diesel D13000 engine driving a Gardner-Denver compressor (inset).**

# of Your Diesel Fuel

into the combustion chamber. The oil industry was in the position at that time, of having a by-product for which there was little demand. Between the kerosene and the lubricating oil "stock" cuts there was probably 10 or 15 gallons in every barrel of crude oil that had little or no market and hence little or no value.

### Diesel Engine Opened New Market

Here was the cheap fuel on which the diesel would and could operate. The oil refineries were anxious to get rid of it. Production costs were being absorbed in the production of other petroleum products, hence the cost of "fuel oil" was practically zero. The fuel oil barrel was probably worth more, in the market of that day, than the fuel oil itself. The situation seemed ideal for all concerned and it was more or less on that basis that the diesel was launched on its career in American Industry.

The fact that the diesel engine was an efficient device by which power could be produced at a minimum cost even though fuel costs were comparatively equal to gasoline, received little attention. The mechanics of that fact were more difficult to explain and harder to be understood by the layman. The layman could easily understand that he could save perhaps 10 to 15 cents per gallon on his fuel costs by using this engine that could burn "anything." Being the easiest selling approach, the diesel was given a reputation that it never could live up to, namely, that almost any fuel was good enough.

Ever since the diesel has come to be one of our prime factors as a power producing engine, it has had to battle against this matter of unsuitable fuels. Every diesel owner or operator who has had one of these engines under his supervision is well aware of this problem of securing a suitable fuel. He has run the gamut of first trying to find a fuel that would not put his engine out of service, and, after having found such a fuel, he appreciates the trouble of securing a dependable source for that consistently good fuel.

During the past few years, when engine speeds have been increased, to reduce the "power to weight" ratio, fuels have necessarily been the subject of intense investigation. These investigations have been very enlightening.

• **Above: United Electric Coal Company, one of Illinois' largest coal producers, operates 21 of these Cummins diesel - powered Autocar trucks on their various operations. Here a Bucyrus-Erie 85-B loads one of the trucks at the company's Buckheart mine.**

We have found that the diesel demands good fuels. We have found that while the diesel will operate on powdered coal dust, it will not operate very long and that the result is rather disastrous in terms of maintenance and wear costs. We have found that the diesel has a right to demand special fuels and will justify the cost of special fuels. We know that these high speed diesels need fuels of light volatility and need to have fuels of proper ignition characteristics. Fuels that are free from dirt and fuels that avoid the formation of gums and sticky residues are superior, as such characteristics are now known to be essential to good diesel performance.

The growing acceptance of the diesel in industry and the consequent wider use of the diesel is bringing new demands in its service requirements. Where diesels are being used for bus propulsion in city traffic, ordinances are being passed that require freedom from smoky exhausts. Contractors, particularly those engaged in tunnel and allied underground work, are demanding that exhaust gases and smoke be cut to the minimum.

Today the cry is for better fuels. Yet, the average diesel owner or operator will not pay or is reluctant to pay, a higher price per gallon for his fuel oil. He still holds the thought that the diesel "will burn anything" and continues to shop for the lowest price fuel, expecting that fuel to produce efficient results in his engine.

It is our thought that the diesel owner or operator should not be blamed for the attitude he takes. He was educated to that reasoning when he bought his engine. He was led to believe that fuel was unimportant. In the meantime too little effort has been made to change his point of view. The engine builder is reluctant to take a firm position that his engine MUST take a special fuel when his competitor sees fit to soft pedal that point. The diesel operator gets little satisfaction from his fuel oil supplier in the way of information about the fuel he is being sold. The oil refiner is reluctant to set up stocks of special fuels when the market is questionable, because that special fuel costs more per gallon and consequently must bring a better price.

We are in a cycle where all concerned are "waiting for the other fellow" to do something. Situations such as this eventually work out and usually in the best interests of all concerned. In the meantime however, the diesel owner or operator should have at least a thumb-nail picture of what good fuels are, and how they differ. He should be in a position to select a fuel, by being able to use the yardstick he has in his possession, that will measure combustion values.

This "yardstick," while at best is not entirely adequate, is all that is currently available. Fuel oils, like lubricating oils, have their own characteristics. We select a fuel or lubricant to do a given job. Lubricants usually have many jobs to perform whereas our fuel has but one, namely, to produce power with the minimum creation of deposits.

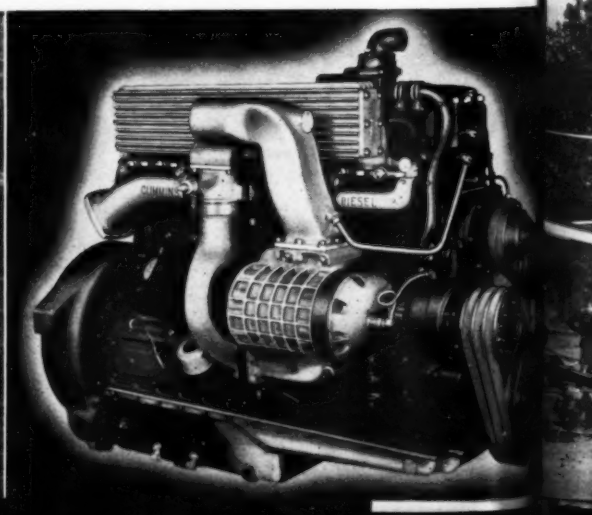
We need not discuss the means by which fuels produce power. We know that they are ignited, and in combustion give off gases. These gases expand in the cylinder and in so doing expend their energy by pushing against the top of the piston. The piston in its downward motion, rotates the crank shaft, thus powering a given mechanism.

The problem is, in part, the securing of a fuel which when burned gives off clean gases and is itself completely consumed. Naptha and gasoline are probably the best of today's fuels, if clean gases and minimum deposits were all that had to be considered. The trouble with these light distillates is that they burn too quickly. As soon as they are ignited they flash into combustion. The reaction on the piston head is one violent push. What we need in the diesel cylinder is not this violent push, but rather a strongly maintained "shove." In other words, we want gases to keep expanding during the greater part of the power stroke of the piston. By this type of gas expansion, we find we are able to get more power from a pound of fuel as against a pound of fuel that is exploded. Thus the heavier distillates of petroleum have been found to have the better ignition characteristic and diesels are powered by what we call fuel oil. One of the first considerations in selecting a fuel is that of body or viscosity.

### Importance of Proper Viscosity

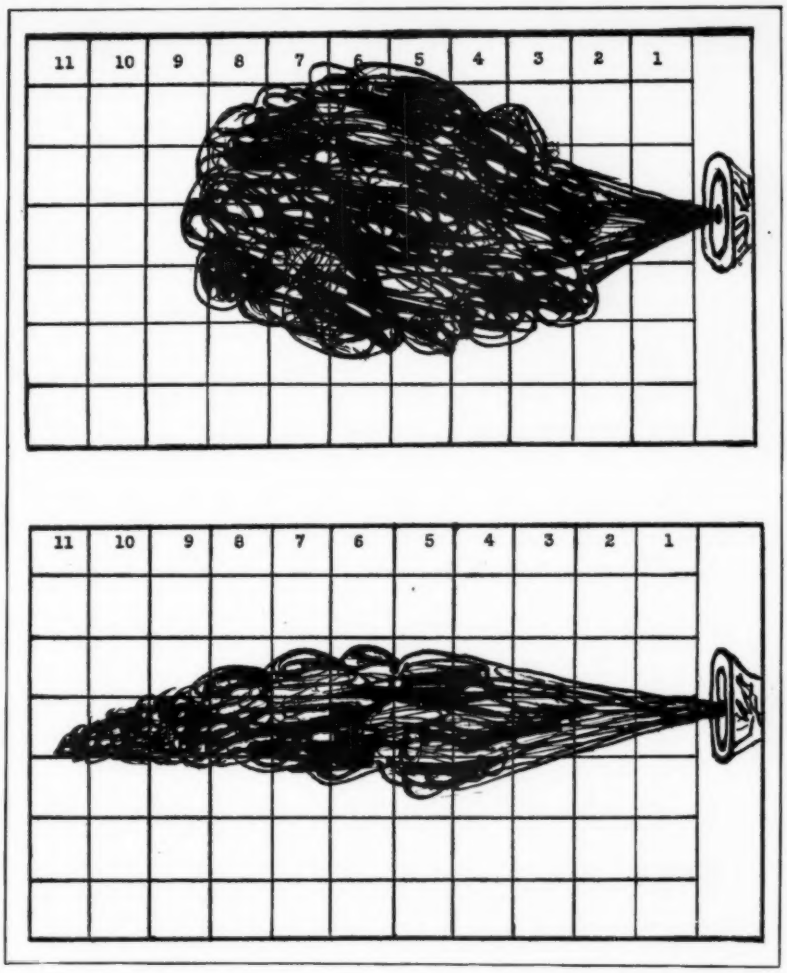
We have already explained why we cannot or do not use naphtha or gasoline as our diesel engine fuel. We know we want a fuel somewhat heavier because of its "slower" burning characteristics.

Another reason we must use



• **Left: A Caterpillar tractor powered by a Caterpillar diesel and a LeTourneau Tournapull equipped with a Buda-Lanova diesel engine team up on a bridge approach grading job near Peoria, Illinois. Right: Manifold side of Cummins Engine Company's 200 h.p. supercharged Model HBS-600 diesel engine. This model is designed for truck, shovel, and tractor use.**

• FIGURE 1, showing variations in diesel fuel atomization. Top sketch shows the wide spray characteristic of a good diesel fuel, and the bottom drawing indicates the "tight" pattern of a fuel too heavy in body.




fuels heavier than gasoline, is because the fuel pump depends on the fluid it pumps to lubricate its tight fitting plunger. In the small high speed diesel, most of which are the four cycle type, the fuel pump makes a delivery stroke every other revolution of the crank shaft. This pump works against pressure ranging from 3,000 to 20,000 pounds per square inch. The only way the plunger of the fuel pump can be lubricated is by the fuel. Hence the fuel must have sufficient body to afford lubrication under these high pressures.

On the other hand we would like to keep the fuel as light in body as possible because light fuels tend to give off comparatively less exhaust smoke. Light fuels are also essential in cold weather operation of the diesel. In cold weather too heavy fuels are hard to move through the fuel feed lines at proper velocity. Lighter fuels, also, have better "spray" characteristics than heavy fuels.

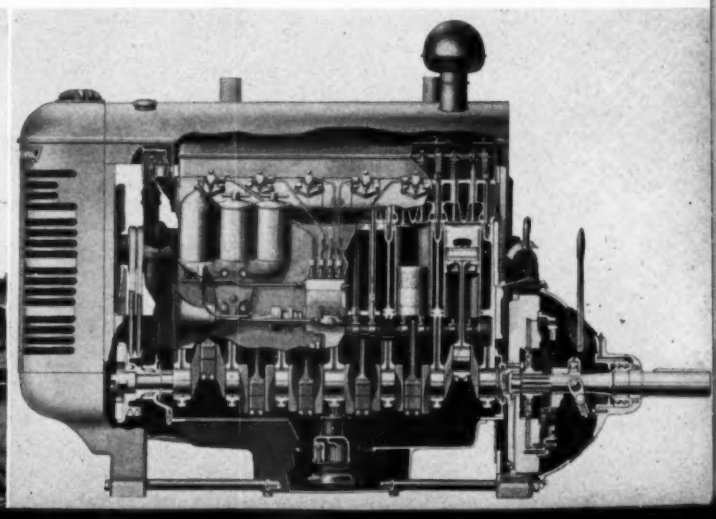
Spray characteristics are important as can be seen in Figure 1. Note the sketch pattern produced by the heavier fuel. The oil is in a "tight" spray, and tends to "wet" the cylinder wall opposite the injection nozzle. Here, laying on the cylinder in measurable quantities, it may be only partially consumed and can easily result in all the evils of incomplete combustion. Lighter fuels are more efficiently atomized and consequently better distributed in the combustion chamber.

Diesel builders in general have set a minimum viscosity of 35 seconds at 100° F. Lighter fuels, of course might be satisfactorily used, particularly in cold weather or where it is essential that clean exhausts be maintained. Lighter fuels have the advantage also in intermittant service, where engine operation is subject to idling and quick acceleration. Heavier fuels may be used and can be used satisfactorily where the engine is maintained under full load for long periods.

In general the 35 second viscosity at 100° F. is about the aver-

(Continued on page 478)

• Left: This Multi-Foote single drum 34-E paver working on Illinois State Route No. 1 out of Rossville is powered with a Hercules DRXB diesel engine. Right: Cross-section view of an International UD-18 diesel power unit.



# DOWNTOWN

**Defense industries increase the responsibilities of Los Angeles' River Channel improvement program. Here's the way Morrison-Knudsen handled their $911,037 contract on this interesting flood control project**

By FLOYD SUTER BIXBY

NECESSARY DEFENSE work in Southern California early this year raised a considerable doubt that the Los Angeles flood control program would continue. The river channels near the city had nearly all been paved. Hansen Dam was completed. Prado and Sepulveda retarding basins were almost finished. On the face of things it appeared that the work stood a better than average chance of being curtailed, and many construction men and contractors in southern California shared that belief.

In April the reassuring word came out from the district engineer of the Los Angeles office of the U. S. Engineers that continuance of the work was vital to the defense program itself. Airplane factories, industrial plants, foundries and other manufacturing establishments were situated in dangerously low ground, and they still stood a chance of being marooned or flooded if the rivers overflowed their banks during rainstorms.

When the bids were called for the construction of the new Sante Fe Dam across the San Gabriel in May, therefore, it became apparent that the flood control work was slated to continue. The result of the bidding disclosed that the lowest bid was the $8,837,199 figure of a firm composed of Morrison-Knudsen, Inc., the Winston Brothers Company, the J. F. Shea Company, and Ford J. Twaits.

That list of contractors is well known and imposing. Construction of the new dam, however, in spite of all that, will present many new problems not encountered before. There will be the job of getting and maintaining earth moving equipment to handle 12,000,000 cubic yards of earth fill in this mammoth dam whose height is 92 feet and whose crest length is 24,000 feet. There will be the scarcity of construction materials. Even now there is a shortage of steel reinforcement, and there doubtless will be other shortages. Building the dam will be just a bit more difficult; it will be more of an uphill battle not alone with the elements this time, but with man made conditions resulting from a war-torn world.

That's the present status of Los Angeles' flood control program as Sante Fe dam contractors line up forces to tackle the local flood problem. However, let's get on to our main subject, the story of a typical Los Angeles River channel improvement contract.

• Bird's eye view of the completed Morrison - Knudsen Los Angeles channel improvement contract. The M-K job extended from the Olympic Boulevard bridge (foreground) to the 4th street bridge which is the fourth structure. (Photo courtesy Los Angeles District Office, U. S. Engineer Department.)

### Job Bid at $911,037

When Morrison-Knudsen, Inc., of Los Angeles, California, landed their portion of the channel route on the low bid of $911,037, their field forces were scheduled for a job mighty close to home as the company's channel improvement contract between 4th Street and

# JOB

Olympic Boulevard was in the shadow of its own district headquarters.

The Los Angeles River, winding a tortuous course from the San Fernando Mountains northwest of the city, threads its way down through Glendale, Burbank, Los Angeles and Vernon and empties into the Pacific Ocean near Long Beach. This puny little stream, which during the summer months boasts a scant flow of 100 cubic feet per second, becomes a raging and destructive giant in the winter rainy season. The channel of the river has such a rapid fall that floodwaters boil through the city at a speed of 15 miles per hour, tearing banks, bridges and every other impeding obstacle out of its way. In the disastrous flood of March, 1938, 70,000 cubic feet per second swelled this little stream out of its banks to tear a path of death and destruction before it. In the wake of the flood a score of deaths and millions of dollars worth of property damage was left. Not a small loss was the destruction of large parts of the improvement work which had been built previously by the U. S. Engineers with hired labor forces.

The Morrison-Knudsen contract closed one of the few remaining gaps in the unimproved downtown section of the river and insured a safe passage for floodwater through the city in the new channel. Hansen and Sepulveda Dams control most of the damaging floodwaters from the base of the San Fernando Mountains to the headwaters of the watershed, and relieve to a great extent the volume of water which must take this improved course to the sea.

*(Continued on page 488)*

**• Top: These two machines handled most of the dirt on the M-K channel improvement contract. The Bucyrus-Erie 2¼-yd. dragline in the foreground is loading material while the Lima 2½-yd. dragline does a little patching of the earth dike on the river diversion channel. Bottom: A Caterpillar equipped with an Emsco 'dozer blade proved to be an excellent unit for dressing the fine grade on the channel slopes.**

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## Construction at 11 Year Peak

Although the total volume of construction contracts awarded in 37 eastern states during June, amounting to $539,106,000, was slightly less than in May, it was, according to F. W. Dodge reports, 66 per cent greater than in June 1940. During the first half of the current year, however, contracts awarded volume reached an eleven year peak of $2,549,962,000, an increase of 57 per cent over the $1,623,087,000 recorded in the first six months of 1940.

At the half-year mark, the major classifications of construction were substantially above the corresponding period of 1940. Non-residential building, with $956,525,000 in contract total, was 105 per cent larger; residential building to the amount of $948,994,000 was 37 per cent larger; public works and utilities, amounting to $644,443,000, showed a 39 per cent increase. Public ownership construction contributed more to the dollar volume of increase in non-residential building than did private ownership, shared almost equally with private ownership construction in the residential building increase and predominated in the dollar volume of increase in public works and utilities construction.

Commenting on the record of the past six months, Thomas S. Holden, president of F. W. Dodge Corporation, has announced:

"Construction activity may be expected to continue at very high levels during most if not all of the next twelve months. Industrial plant expansion continues at an enormous rate. The government aims at stimulating during the current fiscal year a 25 per cent increase in residential building as compared with the volume produced in the fiscal year just closed. A new PWA program of $150,000,000 to provide community facilities in defense areas is just being started, and a new $800,000,000 cantonment program has been discussed as a possibility though the U. S. War Department has not yet formally requested this appropriation. Priority rulings and shortages of certain critical materials favor construction in defense areas and low-priced defense housing over non-defense construction, thus accentuating a situation that would exist, perhaps to a somewhat less degree, under the economic stresses of the times."

## Why You Should Save With U. S. Defense Bonds

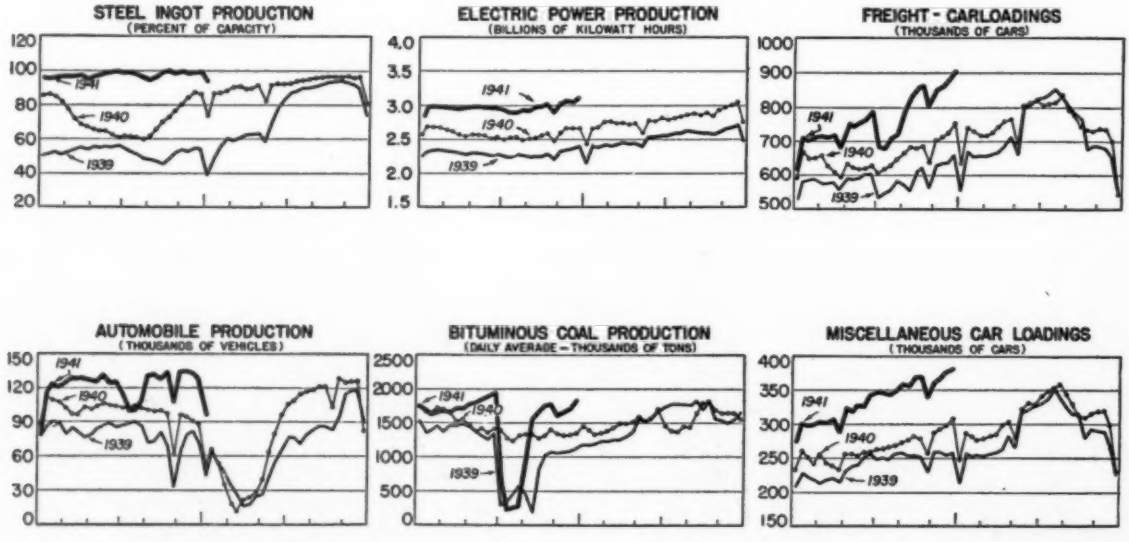
The American people are saving at the rate of $100,000,000 a week!

This is not somebody's wild guess, but an official announcement by the U. S. Treasury Department, that Americans are giving Uncle Sam $100,000,000 a week to save for them—and receiving in return defense savings bonds and stamps.

Bankers, businessmen, bakers, farmers, factory workers, shop girls, housewives, virtually all American men, women and children from all walks of life, are cooperating in the government program to build up a rainy day reserve. In many states, employers are establishing systematic savings plans in cooperation with their employees. Labor and industry both have endorsed the savings program of the government. Nevertheless, there are still many who ask: Why? What is the reason for this national thrift undertaking?

The reasons are manifold. Strange as it seems, with war all around us, America is preparing for peace. In this period of un-

## MONTHLY BUSINESS INDICATORS



limited emergency, vast requirements are being made of industry by the federal government. Wheels are turning at top speed to produce the weapons of defense, weapons that will assure and protect the freedom and safety of the nation. As a result, the national income is jumping sharply. Wages and salaries are increasing. So, too, is employment. Money is more plentiful.

If the country spends a lot of money now, there may be a letdown afterwards. The defense savings program of the U. S. Treasury Department involves the sale of federal securities to as many people as possible in an effort to build as large a reserve as possible against any slump which may follow the end of America's all-out war production.

The cash involved in the purchase of defense savings bonds is put to work at once to protect the freedom of the country. At the same time, the bond protects the individual against financial consequences of a post-war readjustment. Thus, the program achieves a two-fold purpose.

There are three types of defense savings bonds, designed to meet the needs of all people. The Series E, or "people's bonds," however, is the one of particular interest to the average American man, woman and child. This investment preserves the character of the savings bonds which have proved so popular since they were first put on sale March 1, 1935.

These Series E Bonds may be bought for $18.75, $37.50, $75, $375 and $750. They grow in value in ten years to $25, $50, $100, $500 and $1,000, respectively. The annual investment yield is 2.9 per cent a year, compounded semi-annually, when a bond is held to maturity in accordance with a table of redemption values printed on the face of the bond.

Series F, also an appreciation bond, is issued at $74, $370, $740, $3,700, and $7,400. These bonds mature in 12 years to $100, $500, $1,000, $5,000, and $10,000. Series G is designed to meet the demand for a current income bond. These are issued at par and may be purchased in denominations of $100, $500, $1,000, $5,000, or $10,000. Series G Bonds bear interest of 2.5 per cent paid semi-annually by treasury check.

In addition to individuals, these two series of bonds may also be registered in the name of any corporation, association, partnership or trustee.

"And over here, Senator, we're constructing camouflage headquarters"

If an individual should be pressed for cash, the treasury will redeem the bonds before maturity. The full faith and credit of the United States Government are behind all of these bonds.

Defense savings stamps are for the convenience of purchasers who cannot afford to pay $18.75 at any one time. These stamps, on sale at post offices throughout the country and at many other outlets, are issued with handy devices for safe keeping. On the purchase of a 10-cent stamp, a card is furnished for mounting 25 of these stamps which may then be exchanged for $2.50 worth of the larger sizes. With the purchase of a 25-cent, 50-cent, $1 or $5 stamp, an attractive pocket album is given free in which to mount the stamps, which may be exchanged later for a bond.

Secretary Morgenthau has announced that the U. S. Treasury's defense savings program is to be a continuing effort.

"There are no quotas for the country or for any community in it," is the way the treasury secretary phrases it. "There is no time limit. A major object of this program is to give the American people the habit of systematic saving for their country's sake and for their own."

## Santee-Cooper Power Reported Incorrectly

The Editor's attention has been called to a typographical error appearing on page 400 of our July issue in the "Digging Up Power In South Carolina" article. The reference to the power output of the Santee-Cooper power house should have been:

"Annual generating capacity during a year of average stream flow will be 450,000,000 kilowatt hours of primary, and 250,000,000 kilowatt hours of secondary power."

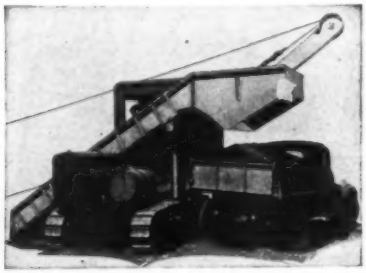
# Equipment

## you ought to KNOW ABOUT

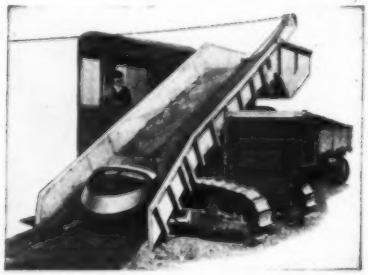
**Scraper-loader**

*Manufacturer:* Sauerman Brothers, Inc., 474 South Clinton Street, Chicago, Illinois.

*Claims:* Hydraulically controlled "teetering" ramp. Equipped with a 1 cu. yd. Crescent scraper bucket. Drag cables are 400 ft. long. The power unit which



operates the scraper bucket is a double-drum hoist driven by either a 60 h.p. gasoline or diesel engine or by a 40 h.p. electric motor. Power is furnished to the crawlers from a take-off on the hoist. In handling loose materials from a pit, bank or stockpile 400 ft. wide, this machine will load an average of eight 5-ton trucks per hour, assuming that the bucket is so operated as to maintain an average length of haul of about 200 ft. Any reduction in haul brings a proportionate increase in hourly capacity. When moving around a job or to a new location, the front of the "teetering" ramp



is raised from the ground and held in place by hydraulic rams. Travel speed, throttle-controlled, is 88 f.p.m.

**Yard crane**

*Manufacturer:* Buckeye Traction Ditcher Company, Findlay, Ohio.

**For further details about the equipment on this page please write to the manufacturer, mentioning Excavating Engineer.**

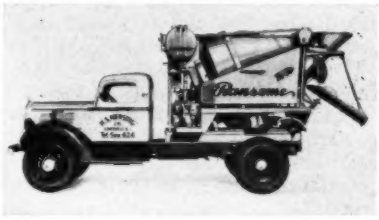
*Claims:* Provides greater stability under heavy loads, facilitates car loading and unloading and working in close quarters. A gooseneck on the end of the boom provides handling of lengthy objects in confined space despite the short boom and speeds unloading of flat cars and gondolas for stockpiling. Material can be stacked 20 feet high or more with ease. All operations in the work cycle of the crane such as swing, boom raising or lowering and load hoisting, are controlled by vacuum power which not only provides fast, smooth operation but enables the

operator to handle more work without tiring. Six small handles on a "desk type" control board are tilted to perform various operations. The vacuum control system eliminates trouble from freezing in winter and condensation of moisture in summer so that it is an ideal all-season machine for outdoor use. Other features of the Buckeye Clipper gooseneck crane include: 175 f.p.m. minimum hoist speed; welded steel box type boom; safety power drum brakes; minimum of 5.25 r.p.m. full swing; quick convertibility to shovel, dragline or lifting magnet; travels, swings and hoists simultaneously; 4 anti-friction bearinged hook rollers; 43 anti-friction bearings; power boom hoist and safety brake; flame hardened gears; and "no chain" power hook-up through gears and double universal joint. Three sizes are available—Model 50, 5-tons, Model 60, 6½-tons and Model 70, 7-tons capacity.

**High discharge truck mixer**

*Manufacturer:* Ransome Concrete Machinery Company, Dunellen, New Jersey.

*Claims:* Designed for a higher point of discharge and differing




in several fundamentals from present designs. Drum rollers are positioned under the center of gravity of the drum practically balancing the load and relieving the strain on the front pedestal bearing. This provides the machined drum track around the center of the drum which tends to act as a reinforcing band where the impact of the intake load is the heaviest and eliminates the long span of light steel drum shell found where the drum track is at the discharge end of the drum and the pedestal bearing at the front. Accessibility to all operating parts. Because there are no drum rollers at the discharge end of the mixer the mixer frame is shorter offering a more satisfactory mounting on truck chasses. Also, because there are no supporting members ordinarily required for the drum rollers at the discharge end of the mixer, the "Hi-Up" may be backed closer to forms and discharged without the use of the chute although a two-piece chute is standard equipment. Designed for combination top or end loading.

**Portable lighting unit**

*Manufacturer:* Lister - Blackstone, Inc., Milwaukee, Wisconsin.

*Claims:* Fully self - contained source of light and fills the need where power lines are unavailable or where the connection and set-

# WHEN EVERY PAY YARD COUNTS

THESE are the days when every minute and every yard of payload count. On defense jobs all over America, "Caterpillar" Diesel Tractors are working twenty-four hours a day without a break. And they're smashing all production records for moving earth and rock!

Watch them work and you'll see that one big reason for this is *traction*. Rugged power, scientifically balanced weight, and long, broad tracks with deep-biting grousers give these husky machines tremendous tractive force — on any kind of footing — stiff grades or gumbo mud!

Time won't wait for weather. And since time is the all-important factor in defense, you need equipment that will stay on the job — keep going on schedule, rain or shine. With "Caterpillar" Diesel Tractors, Engines and Motor Graders, you get fuel economy and tough dependability that bring the cost figures down. But beyond that you get weather-beating, load-moving power and traction that keep production up!

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

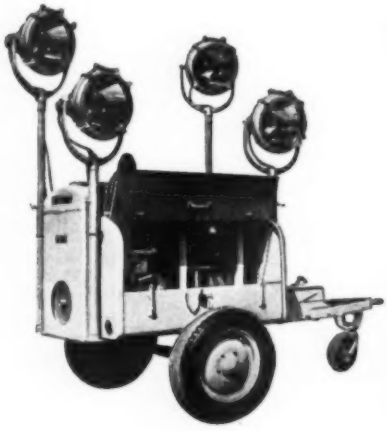
## CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES AND ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINERY

• *Out of the hole with 16 pay yards on the wagons! "Caterpillar" Diesel D8 Tractors, each pulling two Athey wagons in tandem, average 5 trips per hour, 24 hours a day, on this rush TVA project near Jefferson City, Tennessee.*

up would be too expensive. Four 1,000 watt wide-angle floodlights, one on each corner, cast powerful beams in the same or different directions. Each light is individually operated from a control panel and is adjustable up and down, and in all directions. The lights may be raised to a height of 8½ feet and swung in a 180-degree vertical arc. In addition to providing light, this unit has a control panel with receptacles for operating small "Universal" hand tools, such as electric drills, saws and hammers. Power is supplied by an air-cooled, 14 h.p. LeRoi engine, equipped with an electric starter. A 5,000-watt self-regulating D.C. generator, connected to the engine, delivers direct current at 110 to 120 volts; the voltage being adjustable by means of a rheostat



located on the control panel. A sheet steel enclosure with hinged side covers houses the entire assembly, including large tool boxes. Mounted on heavy-duty, multiple leaf steel springs with two pneumatic-tired wheels. Height with lights down is 7′; width 5′; length 9′4″; weight is 1,775 pounds. Also available without running gear for truck mounting.

### A.C. Electric arc welder

*Manufacturer:* Ideal Commutator Dresser Co., 4104 Park Ave., Sycamore, Illinois.

*Claims:* Simplified welding is the outstanding feature. Design includes a reactance winding on a separate core in addition to the transformer. This reactance winding acts as a stabilizer, making it easy to strike an arc and hold it. As the distance between the end of the welding rod varies, this reactance winding causes the voltage to vary proportionately so

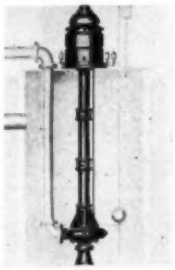
**For further details about the equipment on this page please write to the manufacturer, mentioning Excavating Engineer.**

that the arc is always smooth. Fifteen different welding heats between 20 and 175 amperes give the operator accurate heat and penetration control for each individual job and different parts of the same job. Penetration may be up to ¼" or more if desired. These heats are at two voltages—45 and 70 volts. The standard welder is for 230 volt, 60 cycle operation. Accessories available with the Weld-Master include ground lead, electrode lead, electrode holder, welding rod, primary cord and plug.

### Sump and bilge pumps

*Manufacturer:* Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.

*Claims:* Specifically designed for intermittent-duty sump or bilge pumping, wet-pit, or submerged service. Available in 2, 3, 4, and 5-inch sizes for capacities up to 1400 g.p.m. for heads up to 120 feet and settings up to 25 feet. The pumps in the larger discharge sizes handle solids up to three inches in diameter without difficulty. Installation of the new F-M 541 OSS pumps is simple and inexpensive. No dry, watertight pump pit is required, for the pump is designed for suspension from the floor level into a sump or bilge. Construction features include a basic pump design developed around the Fairbanks-Morse non-clog trash pump so successfully used since 1923 in municipal and sanitary sewage service; enclosed impeller with two well - rounded veins; motors of vertical, hollow-shaft, waterproof construction which employs the exclusive F-M copperspun rotor; high torsional - strength special steel shaft developed as a result of extensive experience in the deep well turbine and propeller pump

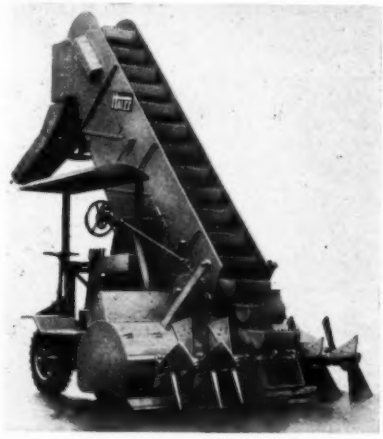


field; cast-iron volute free from all wearing rings such as used in water pumps; discharge openings that can be placed readily in any one of eight positions; and corrosion-resisting closure cover and closure seal which replace the stuffing box and adequately protect cast-bronze pump bearings.

### Pneumatic-tired loader

*Manufacturer:* George Haiss Manufacturing Company, Inc., 144th Street and Park Avenue, New York, New York.

*Claims:* Is the wheel-mounted counterpart of the Model 80 creeper-tread model. Its digging-loading mechanism is the same and the rated capacity likewise, 3 to 5 cu. yards per minute in heavy duty work up to the handling of the larger sizes of crushed stone. The model 80W weighs 20,000 lbs. Single 9.00-20 tires in front and



dual tires of the same size in the rear all carry approximately equal loads. The 80W has been designed on a 7 ft. wheelbase, with 8 ft. 10½ in. width over rubber in the rear, and 6 ft. 9¼ in. tread width in front. Road speed is up to 5½ miles per hour. Powered with a 50 horsepower gasoline motor of standard make. Newly designed, heavy duty clutch and gear box, in which all shafts are mounted on Fafnir deep-grooved ball bearings of the external self-aligning type. A pedal operated traction brake, with latch, is provided. All controls are grouped at the operator's platform. A notable design feature is the 11 ft. 4 in. clearance under the discharge chute at 35° setting. This takes care of high truck bodies as now commonly employed. At 50° discharge angle setting of the chute, the clearance is 10 ft.

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For many years International TracTracTors have proved their power, economy, and solid worth in the service of Industry. Now they are chosen to add their mighty pull to the nation's growing defenses.

In the Army the familiar red exterior of these big crawlers is replaced with regulation olive-drab — *almost nothing changed but the paint!* Underneath you'll find the same great combination of power and stamina that makes International TracTracTors famous wherever hard work must be done . . . in the armed forces and behind the scenes.

It will continue to be this Company's No. 1 job to supply all possible power for the greater strength and security of the United States of America.

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# INTERNATIONAL Industrial Power

# Field NOTES

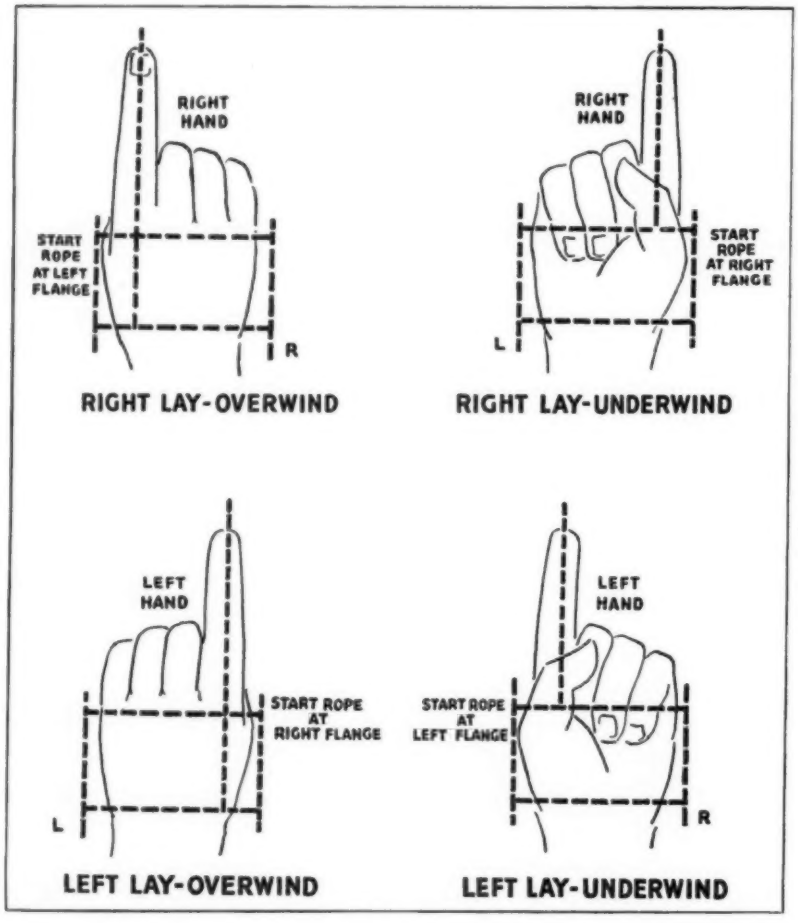
## Drum Reeving Simplified

There is a rule, a rather complicated one, that tells at which drum flange to start roping a smooth drum. If started at the proper flange, the rope will wind with the wraps tightly hugging each other. It will so wind itself on the drum that there will be no space between wraps into which a wrap from the layer above might squeeze and cause serious scrubbing, scarfing or binding.

To reduce the tendency for rope to spool unevenly, many users are employing the preformed type, since in the manufacture of this type of rope practically all internal torsional stresses are eliminated. One result of "preforming" is to make the rope resist rotating when passing over drums and sheaves. This resistance to rotating, whipping, together with its freedom from "crankiness" permits preformed rope to spool well. However, regardless of the type of rope used, all ropes should be properly started on the drum. Here's the rule:

When a right-lay rope is being underwound on the drum (which is to say, it leads from the bottom of the drum) start it from the right flange, looking at the drum from the rear. If a left-lay rope, start it from the left flange. Conversely, if a right-lay rope is being overwound (that is, it leads from the top of the drum) start it from the left flange. If a left-lay rope (overwound) start it from the right flange.

That's a complicated rule to remember, and more frequently than not quick reference to it is not available at the machine. So, here's a far simpler rule, using your doubled-up fist to represent the drum, and the index finger to indicate the flange. With right-lay rope use the right fist. With left-lay rope use the left fist. For overwound rope keep your fist back up. For underwound rope, palm up. Pointed to the drum the index finger will indicate both how the rope should lead from the drum and from which flange. The accompanying illustrations show how easily this rule may be applied.—*American Cable Division, American Chain & Cable Co., Inc.*




• An easy way to remember at which drum flange to start roping a smooth drum is this simple hand reminder stunt. The doubled-up fist represents the drum and the index finger indicates the proper flange to start winding. This chart may be clipped and mounted in a handy spot for convenient reference.

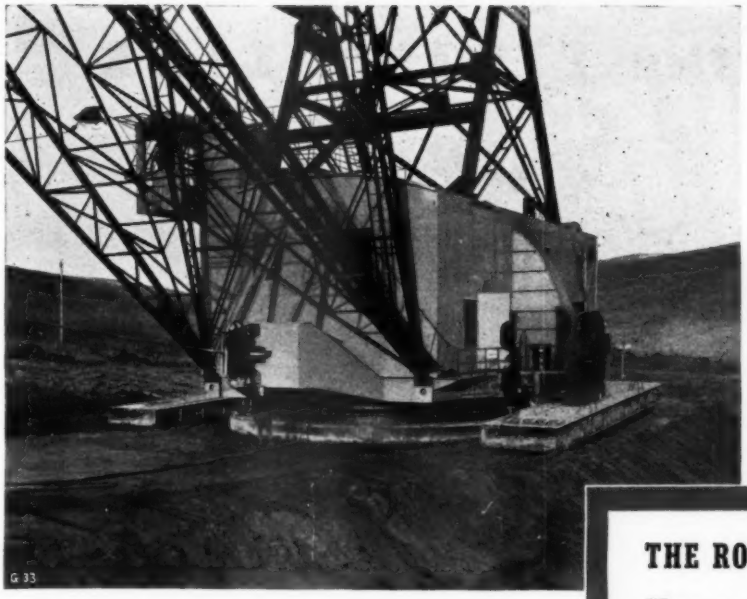
## Aspects of Public Contracts

Every excavating contractor who undertakes public work should constantly bear in mind that inspectors and engineers who supervise a job for a city or other public agency do not ordinarily have any power to make contracts. Their duty is to see that contracts are performed as written. Reminders on this point frequently appear in court decisions in cases growing out of claims for extra pay.

An example appears in the recent case of Atletwed v. City of Marysville, 294 N. W. 110, where plaintiff sued for extra pay under a contract to construct a municipal water supply intake. The specifications provided for construction of a complete crib, "with all necessary pipe and fittings as shown on plans, * * * and shall include necessary excavation."

As to the city's inspector, the Michigan Supreme Court said: "The inspector had no authority to in any way modify or change the contract. Neither did he have authority to bind the city to the payment for any extra work or material."

As to the city engineer, the court said that he "was without authority to change or modify the contract but would have authority to bind the city for payment for extra work found necessary. He would not, however, have authority to bind the city for extra compensation for work or material that plaintiff was bound to furnish under his contract. Plaintiff's contract bound him to perform all necessary excavation. No change could be made in this contract except by authorization of the city council." — *Arthur L. H. Street*



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1. All loads distributed over a wide area.
2. The long hinged shoe attachment provides compensation for uneven ground and a wide distribution of the weight into the shoes.
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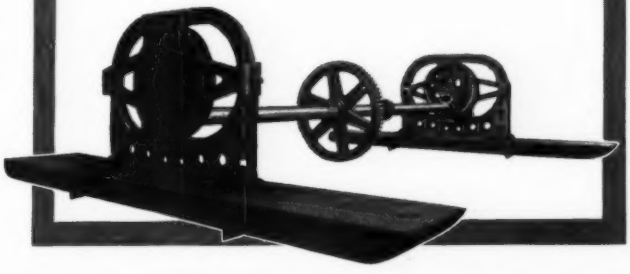
4. Low total lift of base permits efficient walking on grades.
5. A substantial construction that permits efficient walking of a 2,000,000-pound dragline.



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# *Shots* from the FIRING LINE

## W. Virginia Ready for Tri-State Highway Improvement

West Virginia Road Commissioner Ernest L. Bailey announced July 8 in Charleston that an ambitious $2,150,000 tri-state highway program involving the Potomac and Shenandoah rivers may get under way by fall.

Noting that West Virginia's plans were about 30 per cent complete, Commissioner Bailey, who will direct his state's share of the West Virginia-Virginia-Maryland project, added that he doubted if construction work could be started by any of the states for two or three months.

The program comprises an agreement under which Maryland will construct the proposed Sandy Hook bridge across the Potomac near Harper's Ferry and approaches on the Maryland side at a cost approximating $1,000,000, while West Virginia will build a bridge over the Shenandoah and a road from Harper's Ferry at an estimated cost of $750,000, and Virginia, at a cost of about $400,000, will construct an approach to the south end of the Sandy Hook bridge and a road connecting the span to a highway leading to Washington and Harper's Ferry, along the south bank of the Potomac. Part of the work will be financed by federal flood-drainage funds.

## Toll Road Bill Proposed

A bill providing for the creation of commissions to construct, maintain and operate toll highways, bridges, tunnels and ferries has been introduced in Congress by U. S. Senator William H. Smathers, New Jersey Democrat. The measure is recorded as Senate Bill No. 1732.

Declaring he is sponsoring the proposed legislation because of the serious need of modern highways, Smathers stated:

"The new roads, which are needed now, cannot possibly be financed with state or federal funds without seriously adding to appropriations and bond issues.

"Surveys over routes where toll roads, tunnels and bridges have been constructed indicate clearly that 25 to 40 per cent of the motorists will glady pay a reasonable toll for the use of modern highways. Obviously the construction of such roads would materially reduce the number of motorists on existing highways and thereby relieve traffic congestion."

Under Smather's plan the roads would be turned over to the states through which they pass after they had been paid for by tolls. The plan calls for the construction of transcontinental roads and superhighways around metropolitan centers.

• London, England, puts a Caterpillar tractor equipped with a La-Plant-Choate 'dozer to work cleaning up debris left by a bombing attack.

## All-American Canal Completed

The biggest irrigation ditch in the world, the All-American Canal, which parallels the Mexican border in southern California, feeding half a million acres of rich crop land, is now in action its full length.

The canal has a maximum width at the water surface of 232 feet near its head and is more than 20 feet deep. It extends from the outlet works of the Imperial Dam on the Colorado River in Arizona-California 80 miles along the border to the western edge of the Imperial Valley, which it supplies with irrigation water.

Bureau of Reclamation officials report that the canal has a flow of 2,600 cubic feet per second and is delivering water at various points along the line to branch canals in the Imperial Valley, America's all-season fruit and vegetable basket.

The flow in the canal during day periods has also been sufficient to supply the full Imperial Irrigation District power load. There are two power plants in operation on the All-American Canal with a combined capacity of 30,000 kilowatts. The two plants generated 3,000,000 kilowatts in June. A total of 5 plants with a capacity of 87,400 kilowatts ultimately is planned.

Construction is proceeding on the Coachella Canal, the main branch of the All-American extending 130 miles to the Coachella Valley north of the Imperial Valley. Excavation is completed for about half the distance, to the Dos Palmas area north of the Salton Sea.

The Coachella Valley has an irrigable area of 160,000 acres which will be provided with water by the Coachella Canal. The valley now has only about 15,000 acres under irrigation with water pumped from wells.

The All-American and Coachella canals together will supply water for about 1,000,000 acres of land, of which about half is now under irrigation.

### Virginia Calls For Volunteer Aircraft Warning Observers

Guy W. Sackett, vice-president of Mason & Hanger Company, Radford, Virginia, has asked for our help in assisting the Virginia Defense Council's search for volunteers to man aircraft warning stations that will be spotted to give advance warning of planes passing over the mountains of Virginia. United States' citizens living in this area who are below or above draft age or who are physically incapacitated for service with the Army or Navy are needed at this time if they are not employed in a defense industry. Since most of our readers are engaged in outdoor construction work many of them may want to offer their services in connection with the performance of their normal duties or with only a little extra time. For further information write, wire, or phone Mr. Sackett at Radford, Virginia.

## Dredge Workers Decision Reversed

A ruling that employes on dredges who operate the dredging mechanisms will not be regarded as seamen exempt from provisions of the federal wage-hour act was issued June 21 in Washington by Wage-Hour Administrator Philip B. Fleming.

This new stand is a reversal of that taken by General Fleming in July, 1940, when a strike of Smoot Sand and Gravel Company workers tied up building construction in the District of Columbia. In a letter to the Smoot firm at that time, General Fleming said he had reached the conclusion, on the basis of

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**"Like sheets of rain"—VOLCANIC ASH day after day swept over the 7 ALLIS CHALMERS "HD14" 2-cycle Diesel tractors on the flood-control job at Walla Walla, Washington.**

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Thanks to its exclusive compounding, RPM DELO controls engine wear, even under adverse conditions. What's more, it prevents ring-sticking—ends sludge trouble—"stays put" at hot spots which other oils tend to leave dry.

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REG. TRADE-MARK
DIESEL ENGINE LUBRICATING OIL

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the facts submitted, that the dredge workers were "seamen," and therefore exempt from provisions of the act.

The new ruling followed a recent decision of the United States Fifth Circuit Court of Appeals regarding application of the wage-hour act to men employed as seamen. In the case involved, the court held that exemption applies to employes whose duties are concerned with the navigation of vessels. While holding that certain barge tenders were seamen, the court emphasized they performed services which related to the welfare, operation and safety of the barges.

General Fleming pointed out that the decision does not cover workers who perform other duties, such as stevedores. In view of the court decision, he said, employes on dredges who operate the dredging mechanisms will not be regarded as seamen but will be considered as subject to the provisions of the wage-hour law.

## Plan $287,000,000 For Defense Roads

The House Roads Committee has reported H. 5110, the "Defense Highway Act of 1941," authorizing appropriations of $287,000,000. Maximum amounts authorized for specific purposes follow:

$100,000,000 would be for immediate correction of critical deficiencies in roads and bridges of approximately 78,000 miles on the strategic military system of primary roads;

$150,000,000 for construction and improvement of access roads to military and naval reservations, defense industry sites and sources of essential raw materials;

$2,000,000 for experimental flight strips along public highways;

$10,000,000 to cooperate with the states in making advance highway engineering surveys, and

$25,000,000 to reimburse states for repairing roads damaged by the Army and Navy.

Federal funds would be available to meet the entire cost of the access roads and flight strips. There is no requirement for apportionment of access road funds among the states. Projects on the strategic system will be financed one-fourth from state funds and three-fourths from authorized federal appropriations, instead of on the customary basis of 50 per cent by the states and 50 per cent from federal funds. This more favorable formula applies also to unexpended federal aid money now allocated to the strategic system. Unspent state funds now allocated to match regular federal aid money on strategic system projects therefore will go twice as far as formerly.

The general provisions of S. 1580, the defense highway bill already passed by the Senate, are incorporated in specific terms in the House bill, and in addition the latter provides, among other things, federal acquisition of rights-of-way and extension of the strategic system without regard to state lines.

The House Committee will ask for a special rule to speed final action on defense highway authorizations.

The following table shows the approximate amount which would be made available to each state under Section 2 of the bill for improvements on the strategic highway network:

| | Amount |
|---|---|
| Alabama | $2,080,245 |
| Arizona | 1,435,382 |
| Arkansas | 1,707,928 |
| California | 3,982,125 |
| Colorado | 1,798,524 |
| Connecticut | 620,997 |
| Delaware | 487,500 |
| Florida | 1,425,748 |

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## HOW MUCH IS "HOW MUCH"?

Your "quotation" from Westinghouse includes more than a piece of apparatus. It covers intimate engineering knowledge of your industry—necessary to design equipment to meet your needs. And it embraces accurate application experience to enable you to obtain the greatest possible return from your investment.

## WESTINGHOUSE BUILDS TOUGHNESS AND ACCESSIBILITY INTO SHOVEL MOTORS

IDLE SHOVELS cost you money. To minimize this loss, insist on Westinghouse electrical equipment . . . with motors that have the extra stamina to run and run and run. And when maintenance *is* necessary, ready accessibility makes service easy and inexpensive. Result —more "working hours" to move the ore.

You will find Westinghouse an able partner in solving any electrical mining problem. Matching equipment to the job is a Westinghouse specialty, developed out of long, practical experience in designing and building all types of mining apparatus. Thus, from linestarter or floodlight to Ignitron rectifier and complete switchgear . . .Westinghouse equipment "has what it takes."

Call on your local office to assist you in meeting any electrical need. You can count on Westinghouse experience to help you move the ore more profitably.

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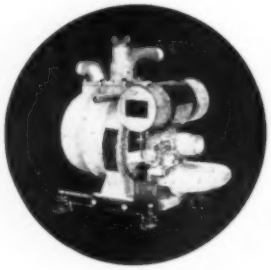

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**SAVES HOURS OF EXCAVATING TIME**

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**SAVES MAN-POWER AND MAINTENANCE COSTS**

Weighing only 91 pounds complete, a Homelite is really a one-man pump—easy to pick up and carry; easy to operate. And after a quick start it needs no manual attention. There are no cleaning troubles. Nothing complicated. The whole unit is ruggedly built—the kind of pump that stands up in all kinds of weather and under hard continuous use.

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| | |
|---|---|
| Georgia | 2,519,366 |
| Idaho | 1,235,985 |
| Illinois | 3,954,419 |
| Indiana | 2,415,900 |
| Iowa | 2,505,523 |
| Kansas | 2,539,360 |
| Kentucky | 1,840,894 |
| Louisiana | 1,467,188 |
| Maine | 866,500 |
| Maryland | 833,715 |
| Massachusetts | 1,311,369 |
| Michigan | 3,028,316 |
| Minnesota | 2,709,402 |
| Mississippi | 1,773,232 |
| Missouri | 2,967,206 |
| Montana | 2,018,907 |
| Nebraska | 1,991,356 |
| Nevada | 1,274,718 |
| New Hampshire | 487,500 |
| New Jersey | 1,274,429 |
| New Mexico | 1,620,981 |
| New York | 4,824,597 |
| North Carolina | 2,378,838 |
| North Dakota | 1,504,377 |
| Ohio | 3,526,168 |
| Oklahoma | 2,271,217 |
| Oregon | 1,647,906 |
| Pennsylvania | 4,095,568 |
| Rhode Island | 487,500 |
| South Carolina | 1,341,640 |
| South Dakota | 1,583,613 |
| Tennessee | 2,114,507 |
| Texas | 6,294,440 |
| Utah | 1,123,714 |
| Vermont | 487,500 |
| Virginia | 1,844,069 |
| Washington | 1,580,939 |
| West Virginia | 1,095,332 |
| Wisconsin | 2,406,404 |
| Wyoming | 1,246,353 |
| Hawaii | 487,500 |
| District of Columbia | 487,500 |
| Puerto Rico | 495,603 |

## Delaware's Road Plans

Delaware's State Highway Department will receive appropriations of $1,000,000 during each year of the coming biennium for road construction under terms of a bill recently passed by the state senate, following previous approval by the House, in which it was introduced by Representative Robert H. Richards, Jr.

The measure will make available to the state a total of $3,560,000 for road construction, including $1,560,000 in federal funds and the $2,000,000 from the state, divided into equal annual allotments.

## St. Louis Names New Water Division Head

Thomas J. Skinker, sales engineer for a pipe company and prior to that an employe in the St. Louis city water division for 24 years, has been appointed city water commissioner, by Director of Public Utilities Max H. Doyne.

Commissioner Skinker replaces John B. Dean, water commissioner for more than five years, who was demoted to his former position of division engineer in charge of the supply and purifying section of the water division.

The appointment of Mr. Skinker is

**Thomas J. Skinker**

the first step in the reorganization of the St. Louis Department of Public Utilities, according to Director Doyne. The water division, with more than 900 employees, is the largest in the department.

## Delaware River Tunnel Approved

Plans for a vehicular tunnel under the Delaware River 10 miles south of the Camden-Philadelphia Bridge have the approval of President Roosevelt and RFC Chairman Jesse Jones, it was announced in Washington July 8 by U. S. Senator William H. Smathers, New Jersey Democrat, following a conference at the White House.

Declaring that the RFC was prepared to finance the project at an estimated cost of $19,000,000, under an arrangement whereby toll charges would make it self-liquidating, Senator Smathers added:

"I am now trying to have the Office of Production Management place the tunnel project on a preferred position on the priority list so necessary materials can be obtained. When this is accomplished, the RFC will authorize the joint Pennsylvania and New Jersey commissions, already created, to let contracts and begin the work."

In seeking the approval of the project, Senator Smathers said he emphasized the defense value of the tunnel, connecting South Jersey with the big industrial cities of the East. Previously, he said, General G. C. Marshall, Army chief of staff, indicated to him he regarded such a tunnel of great military value.

The tunnel, which has been projected for years, would run under the Delaware River from Mantua Creek in Gloucester County, New Jersey, to the vicinity of Hog Island on the Pennsylvania side. Engineers estimate that construction of the 6,000-foot tube would require 2,500



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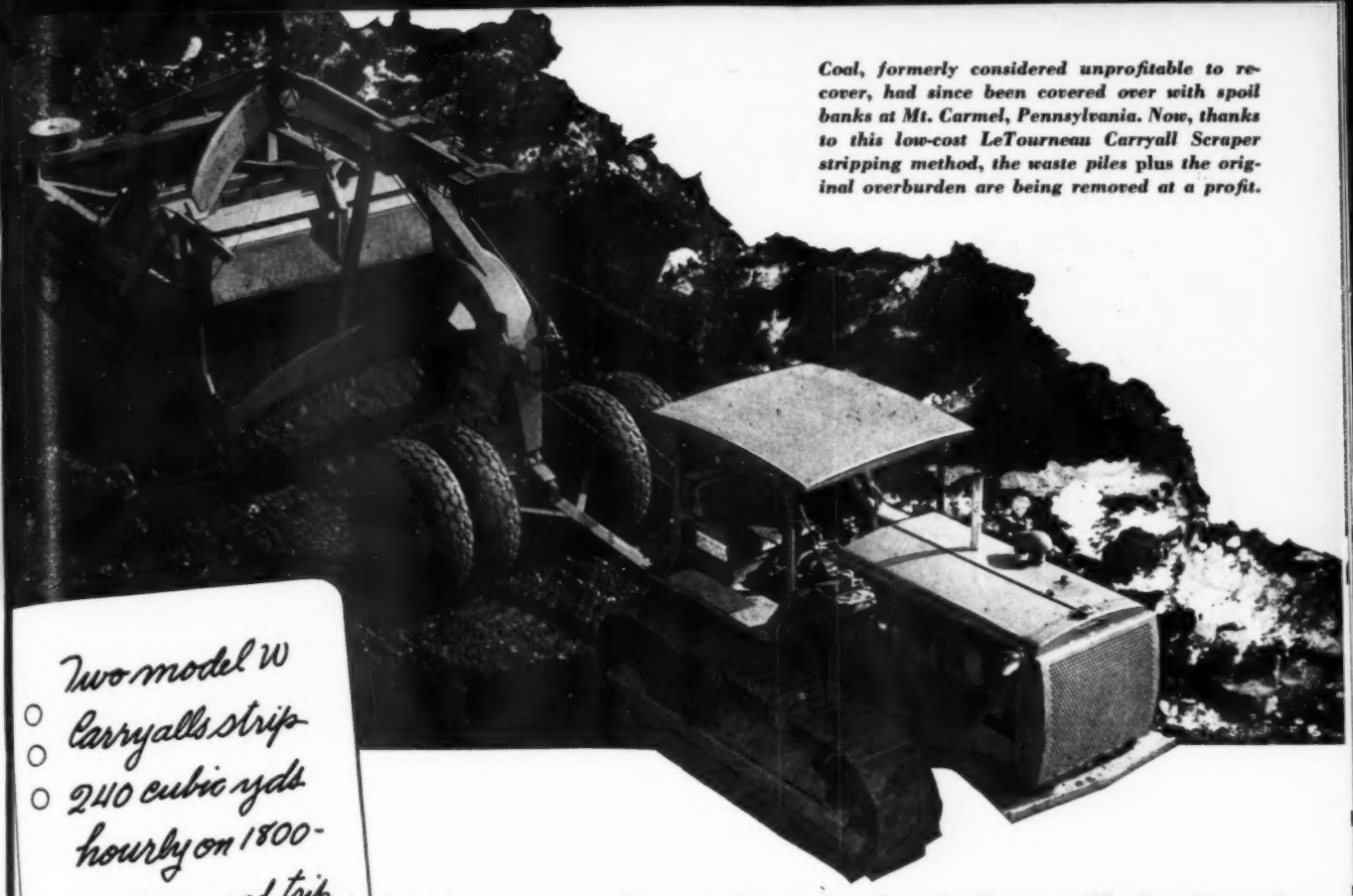

*Coal, formerly considered unprofitable to recover, had since been covered over with spoil banks at Mt. Carmel, Pennsylvania. Now, thanks to this low-cost LeTourneau Carryall Scraper stripping method, the waste piles* **plus** *the original overburden are being removed at a profit.*

*Two model W*
*Carryalls strip*
*240 cubic yds*
*hourly on 1800-*
*foot round trip*

## LeTourneau Carryalls and Angledozer Make Tough

# STRIPPING JOB PROFITABLE

Mining outcrop coal, near Mt. Carmel, Pennsylvania, presented many problems. Surface faults, which threatened cave-ins, prevented conventional tunnel and shaft systems. Multiple equipment investment for stripping by shovel, dragline and trucks made recovery prohibitive. Smart stripping contractors Bridy-Hanlon solved the problem with two LeTourneau W Carryalls, pulled by "Caterpillar" D8 tractors . . . thus, combined loading, hauling and dumping into one continuous cycle of operation. A third "Caterpillar" D8 tractor, equipped with a LeTourneau Angledozer, is used as a pusher, cuts Scraper loading time in the tough, wet shale to help the extra-capacity Carryalls perform as follows:

| | |
|---|---|
| **Haul** | **1800 feet (round trip)** |
| **Load** | **1.0 min.** |
| **Spread** | **0.5 min.** |
| **Turns, gear shifts, etc.** | **1.2 min.** |
| **Travel over variable favorable grades up to 14%** | **6.3 min.** |
| **Total** | **9.0 min.** |
| **Trips per hour** | **6.67 (one unit)** |
| **Excav. Yds. per load** | **18** |
| **Excav. Yds. per hour** | **240 (both units)** |

**. . . Working two 7-hour shifts, that's a combined output of 3360 cubic yards, bank measure, stripped per day!**

Between Carryall trips the 'Dozer handles typical pit maintenance, which further adds to production.

In stripping like this, LeTourneau Carryall Scrapers get big loads just as efficiently along 6-inch overburden as they do on a 30-foot bank. Because Carryalls are long haul rigs, they can waste overburden permanently out of range of future operations to save re-handling. They can be used to build roads, reclaim culm, move spoil banks, etc. In short—wherever there's a stripping or materials-handling job to be done, here's your lowest-cost answer: See your LeTourneau-"Caterpillar" dealer about this modern LeTourneau mining method. Call him TODAY!

### Actual Job Data

**—gathered and compiled by our Field Engineering Department. For aid in planning the best methods of handling your stripping and materials-handling problems, you are invited to call on this department.**

**ANGLEDOZERS*, BULLDOZERS, CARRYALL* SCRAPERS, ROOTERS*, POWER CONTROL UNITS, TRACTOR CRANES, PUSHDOZERS, SHEEP'S FOOT ROLLERS, TOURNAPULLS*, TOURNATRAILERS*, TOURNACRANES.**

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men working for two years. Its proponents claim the tunnel would be used by about 6,000,000 vehicles a year and that its entire cost could be repaid in 25 years through imposition of tolls.

## Wheeling-Ohio County Airport

**By William H. Yenke**

The Keeley Construction Company, with the aid of WPA labor, has moved over 3,000,000 cubic yards of hilltops to fill valleys at the site of the Wheeling-Ohio County Airport, enabling the completion of the three originally planned runways.

Airport runways will be 500 feet wide, the center strips being 100 feet asphaltic concrete, sloped 1 per cent from the center. Ohio county commissioners were recently assured of federal aid by the War department in lengthening the three runways to 5,000 feet each, making the airport one of the most modern in any rugged country.

The airport as designed conformed to CAA requirements for Class 3 airports (July 4, 1940) but conditions astride with progress in preparedness, caused the decision to enlarge the runways as the port is on the main TWA airline course.

Cuts of 100 feet were made, and the earth was used in fills up to 140 feet. Shallow gutters outside the 500 feet runways provide rapid drainage. Drainage under the paving is provided by herringbone pattern crushed stone French drains about one foot square. The French drains lead into 10 and 12 inch tile. Only one point in the field carries drainage from an area above the port, where a 48 inch concrete pipe is used under a 90 foot fill.

Keeley Construction Company supplies all equipment, material and supplies except explosives and fuel. The company also supplies shovel operators and 30 skilled non-relief men to man equipment on a price of 12c per yard. The WPA supplies 31 skilled workers, 42 intermediate workers and 83 unskilled workers.

During a typical operating month, two 12 yard and one 8 yard LeTourneau scrapers moved 85,873 yards of earth, a 2½ yard Northwest shovel loaded

**• Borrow from the hilltops makes fill for the valleys as Keeley Construction Company's 2½-yard Northwest performs grading operations at the Wheeling-Ohio County Airport.**

83,726 yards and a 1½ yard Northwest shovel handled 66,583 yards, mostly shale and limestone, a total of 236,182 yards in two seven hour shifts daily.

Hauling from the shovels were five 12 yard Euclid trucks, two 14 and one 10 yard truck wagons and two each five and six yard end dump, wheel-tractor-mounted hauling units.

Bulldozers, a motor patrol grader, drill sharpener, six portable compressors, and a water truck, complete the contractor's major equipment. Ohio county furnished trucks for hauling stone and two 60 passenger buses to transport labor from Wheeling to the airport.

Unusually good cooperation between Ohio county, the contractor and the WPA resulted in operations being ahead of schedule. Skilled and semi-skilled workers are hired and can be fired by the contractor. Relief workers, found to be laggards are transferred to other projects.

The WPA does all surface work, supplying equipment for stone handling and crushing. A patrol grader cuts the 100 foot runway width to accurate crown, while hand trenching provides the drains. The sub-grade is rolled with a ten ton three wheel roller, following which the base is laid in two courses, rolled to five inch thickness each. Material used is crusher-run from a job plant, 4-inch maximum size.

Stone is secured from storage piles left by the excavation contractor. It is hand loaded and hauled up an overhead ramp, and dumped into a crusher discharging directly to trucks.

A pulverizer is in use to provide added fines for choking the top course. All material is dumped at the point of use, then spread by hand.

In the original plans, the cost of the port was set at $1,784,000. WPA is supplying $1,080,000, the rest coming from Ohio County. The West Virginia state road commission has half completed a 127,000 yard grading job for a one mile access highway to the airport.

Sidney Smith, of C. C. Smith's Sons, consulting engineers of Wheeling is in charge of design and construction. J. C. Cain of Keeley Construction Company, Clarksburg, West Virginia, is in general charge of excavation and grading.


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## Blocks and Linings

Beco Blocks and Linings take the heavy loads at the increased speeds demanded of modern excavating equipment. These Beco products are durable and tough — that's why replacements and adjustments are less frequent.

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Bulldog wedge rope sockets never fail. The harder the pull . . . the tighter the grip! Attachment is easy and quick and directly in line with pull, eliminating costly kinks. Made in a dozen sizes and four different styles. Write for bulletin.

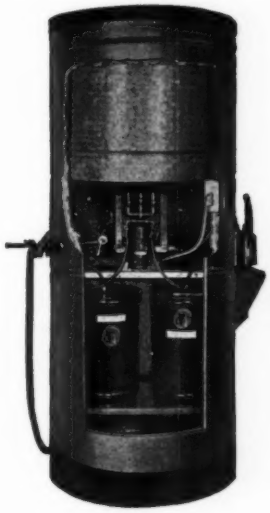
## Wire Rope

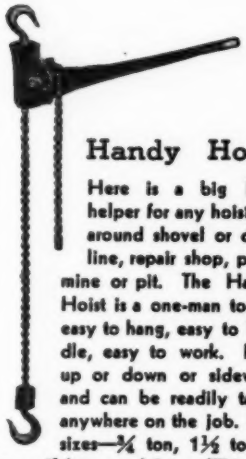
Selected by the men who build your excavating and drilling machinery, Bucyrus-Erie rope has the special features that spell better performance. B-E wire rope has a uniform high quality, and comes in the right sizes, types, and construction for your exact needs. Send for wire rope bulletin.

## New Bucyrus Oil Reclaimer

With the NEW Bucyrus Oil Reclaimer, used oil is reclaimed by a simple washing and filtering process at an average cost of about nine cents per gallon. It is a scientific fact, arrived at by leading research engineers and chemists throughout the country, that engine-use breaks down only the weaker and unstable molecules of your oil. These constitute about 10 per cent of the oil—the other 90 per cent, the strongest particles of the original oil, can be separated and cleaned for re-use by the NEW Bucyrus Oil Reclaimer.

Investigate the possibilities of the Bucyrus Oil Reclaimer before you discard another quart of used oil.





## Handy Hoist

Here is a big little helper for any hoist job around shovel or dragline, repair shop, plant, mine or pit. The Handy Hoist is a one-man tool—easy to hang, easy to handle, easy to work. Pulls up or down or sidewise, and can be readily taken anywhere on the job. Five sizes—¾ ton, 1½ ton, 3 ton, 4½ ton, and 6 ton. Write for descriptive literature.

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No matter how unusual your "push, pull, clamp, or straightening" problem may be, BECO Jack is the tool that gives you a safe, sure, and proved means of doing the job better. Screw lengths—10", 12", 14", 16" and 18". Capacity 35,000 lbs. Send for bulletin.

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New Red Arch incandescent butt-welded dragline chain has twice the strength and wearability of ordinary chain. It will save you extra money because of less shut-down time. You can get any size chain from ⅝" to 1½" to fit your bucket. Write for complete story.

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# NOT in the *Contract*

"I have noticed with astonishment," remarked the Oldtimer, "how reluctant young men of today are to marry and settle down. They actually seem to fear marriage. Why, before I was married I didn't know the meaning of fear."

Rastus brought a ham back to the store, saying it was no good.

"That ham's all right Rastus," the storekeeper insisted. "Why it was cured only last week."

"Well, maybe it's been cured all right," Rastus answered after some reflection, "but it sho' has had a relapse.

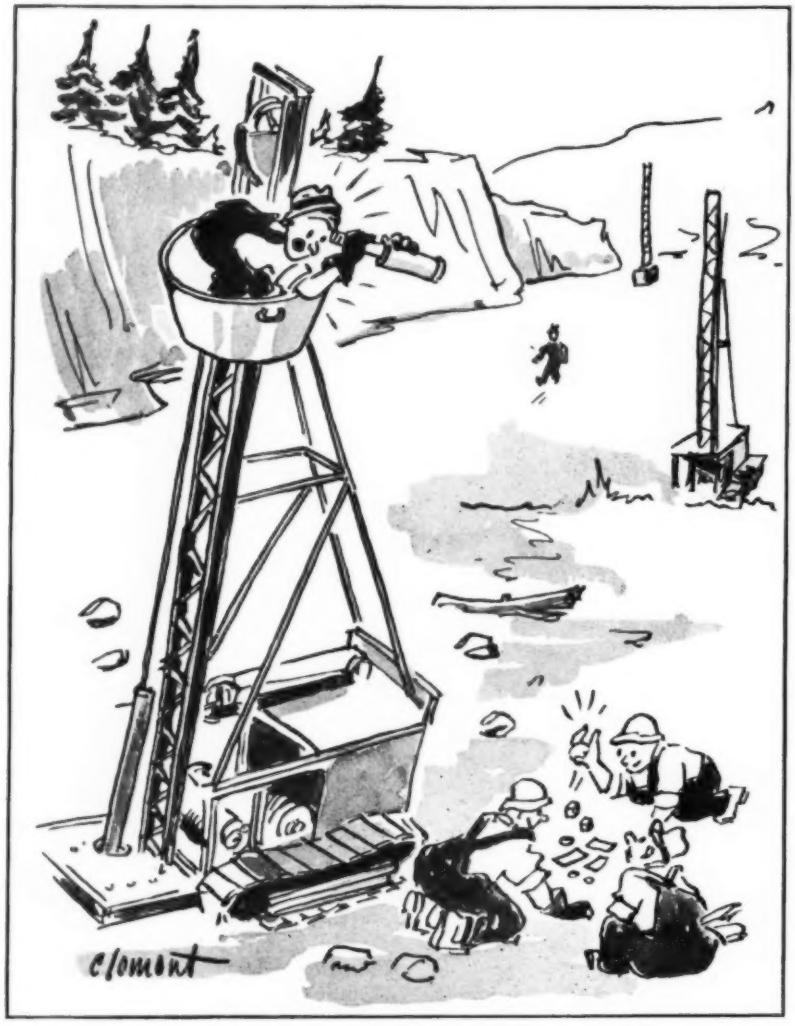
The tourist was visiting an Indian reservation.

"White man very glad to meet Red man," he said to the chief. "White man hopes big chief is feeling very good."

"Hi, fellows," shouted the Indian to his equally up-to-date followers, "come and listen to this guy. He's great!"

Tourist: What a quaint little village! Truly one-half the world is ignorant of how the other half lives.

Native: Not in this village, mister; not in this village.




"Ahoy below! Here comes the boss!"

A young widow put up a costly monument to her late husband, and inscribed upon it, "My grief is so great that I cannot bear it." A year or so later, however, she married again, and feeling a little awkwardness about the inscription, she solved the difficulty by adding one word to it, "alone."

"There was a fire at the Kidmore Hotel last night, and one of the guests escaped down the water pipe."

Sympathetic old lady: "My! How thin the poor dear must have been!"

A tourist returning to this country after a trip abroad was asked the usual question by the customs official: "Have you nothing to declare, Madam?"

"No," she replied sweetly, "nothing."

"Then, madam," said the official, "am I to understand that the fur tail hanging below your coat is your own?"

As a civilian approached the army camp, Soldier Sam Hale cried "Halt!" The civilian halted.

Sam Hale: "Halt!"

Civilian: "But you've already said 'Halt!' and I've halted."

Sam Hale: "My instructions are to cry 'Halt!' three times, and then shoot."

Bulletin in Scotch church: "Those in the habit of putting buttons instead of coins in the collection plate will please put in their own buttons and not buttons from the cushions on the pews."

The principal speaker of the evening was something of a bore. After he had been trying the patience of his hearers for 30 minutes, the chairman noticed that a diner on his right was snoring gently, tapped him lightly with his gavel.

A second time the diner dozed, and the gavel brought him back.

Again the snoring became audible and the chairman, losing patience, plied the gavel to more purpose.

"Go on," was the sleepy answer, "hit me again; I can still hear him."

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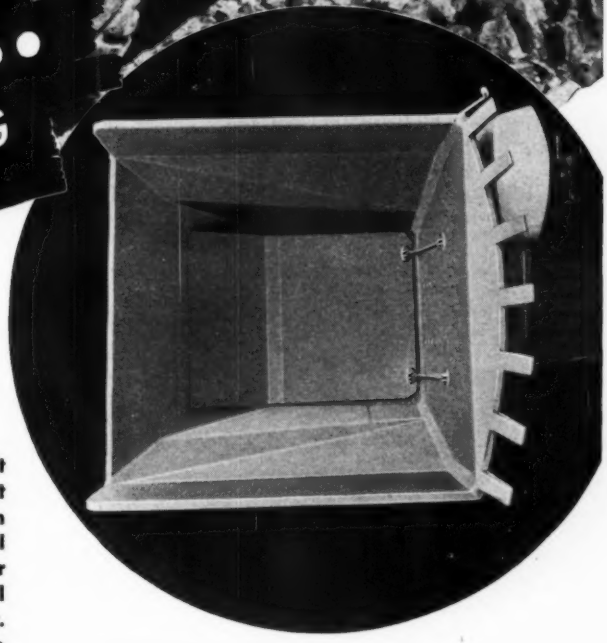

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**Wide body top opening permits instantaneous dumping from the shovel dipper, for more loads per hour . . . more yardage per shift . . . lower hauling costs with the KOEHRING DUMPTOR.**

KOEHRING HEAVY DUTY

## HEAVY-DUTY CONSTRUCTION EQUIPMENT



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# Diesel Fuel

(Continued from page 457)

age recommended for high speed diesel service.

### Flash Point Requirements

The flash point is usually shown in any set of specifications covering a fuel oil. The use of the flash point figure is merely to determine the more volatile component of the fuel oil. For example, it would be possible to "cut" back a heavy oil with kerosene or heavy gasoline to the prescribed viscosity of 35 seconds. If such a blended fuel were used in our diesel cylinder its combustion would be irregular. First these lighter components would be exploded practically upon entrance in the combustion chamber. There would then be a delay until compression temperatures reached a point where the heavy fuel would be ignited. This delay period would result in the uneven burning of the fuel, a condition conducive to a rough and irregular power stroke.

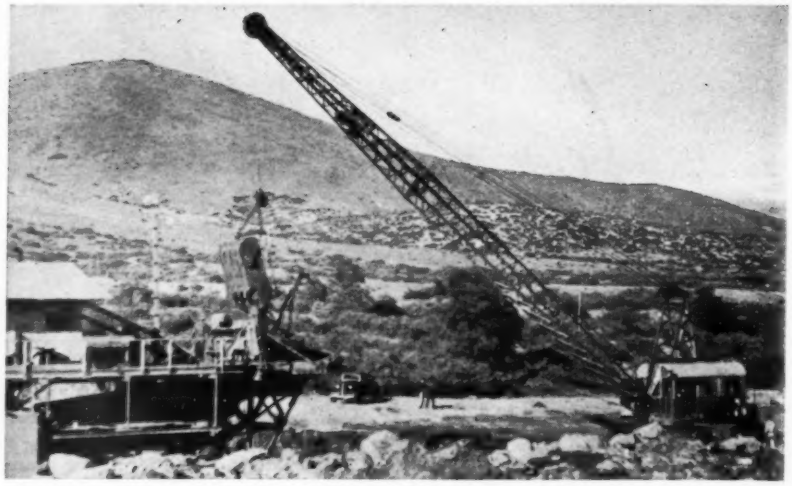
While the flash point is a quick means of determining the presence of any too volatile content, its major use is to cover the requirements of shipping laws which specify certain regulations for fuels of certain volatility.

Flash points should not be lower than 110° F. for light fuels and not lower than 150° F. for the heavier fuels.

The pour point of a fuel is that temperature where the oil will not flow. Hence the pour point of a fuel should be at least 10° below the lowest temperature in which the diesel is to perform.

The pour point of a fuel has nothing to do with its combustion characteristic. In one sense it merely shows the presence of parafinic waxes. While their removal is desirable, the cost involved is too great to warrant that expenditure.

In general the pour test figure of 0° F. in winter and 20° F. in the summer is satisfactory.



• A Cummins diesel - equipped 2½-yard Lima dragline is used by the Big Bug Dredging Company of Prescott, Arizona, to feed their Bodinson washing plant.

• Housing excavation and land improvement grading puts many diesel-powered tractors to work. Here a Bucyrus-Erie Bullgrader mounted on an International diesel tractor works on a swimming pool excavation for Russell Excavating Company, Worcester, Mass.

The cetane number of a fuel oil is a measure or rating of cumbustion characteristics. The method of its determination for any fuel is to run it in a given test cylinder and compare its smoothness of operation. Technically, the cetane number represents the percentage of cetane needed to be added to a fuel to duplicate the "knock" characteristics of a test fuel.

Briefly, the higher the cetane number the quicker the fuel will ignite.

It will be appreciated that in a typical high speed diesel turning over at 2,000 r.p.m. the complete combustion cycle is from one thousandth to six thousandths of a second. In this extremely short interval, the fuel must be injected, atomized, ignited and complete combustion take place. The time is too short to permit control of combustion by mechanical means. We must depend entirely upon the combustion characteristics of the fuel we use to give the action we need in the combustion chamber.

If the fuel is slow to ignite, part of the short time available is lost and we get a delay in the pressure stroke known as "knocking." If the fuel is too quick to ignite we get "detonation." Both "knocking" and "detonation" are an indication that combustion is not smooth and engine efficiency is being sacrificed.

In Figure 2 we show how two

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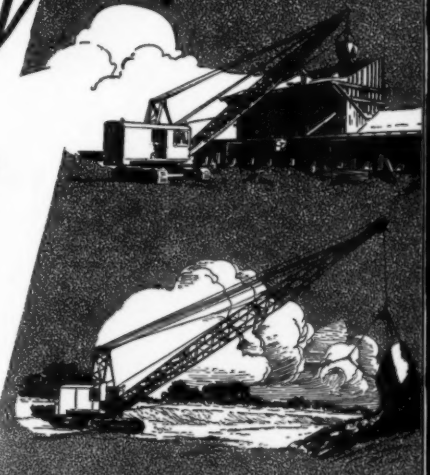

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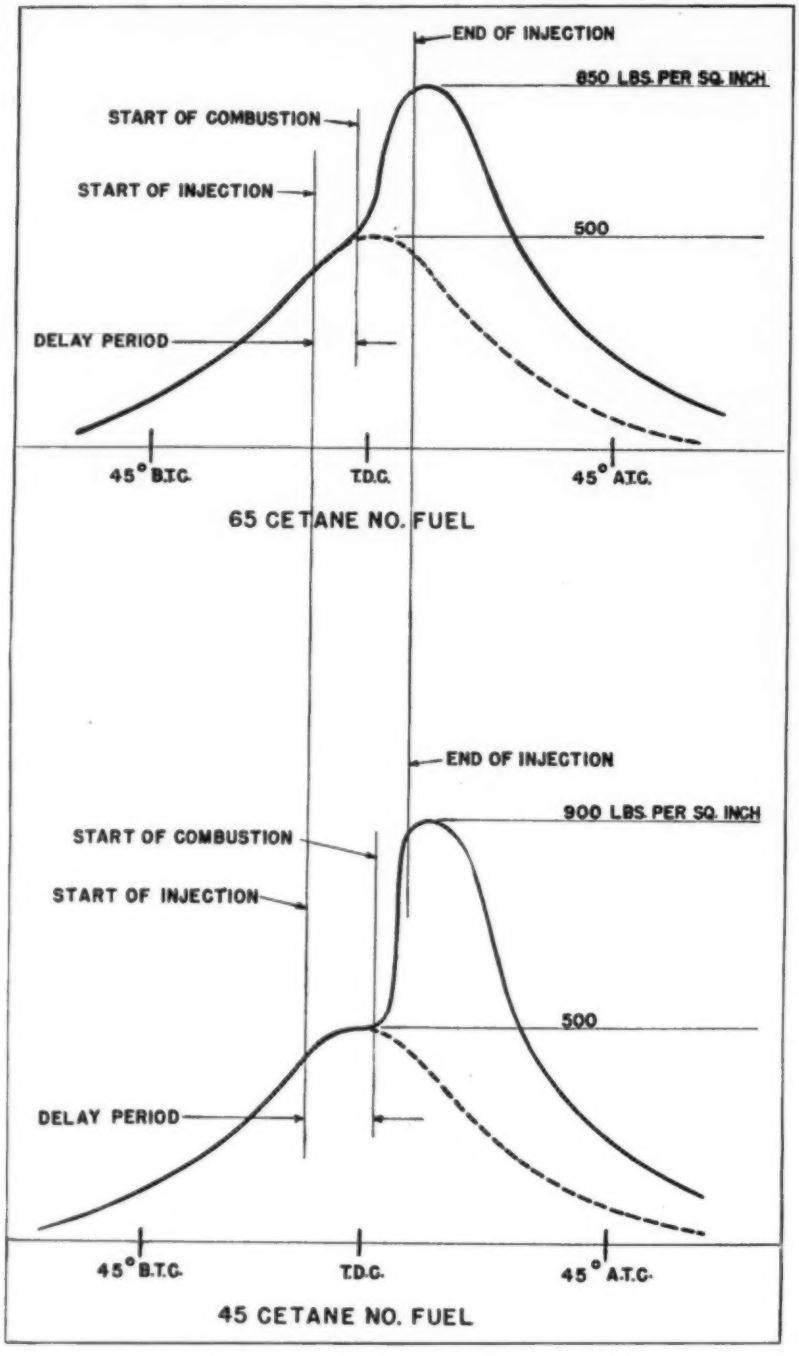



• **FIGURE 2, comparison chart showing how two fuels may vary in action in the combustion chamber. Note the "delay period" of the 45 cetane fuel as compared with the 65 cetane fuel.**

fuels may vary in their action in the combustion chamber. Note the "delay period" of the 45 cetane fuel as compared with the 65 cetane fuel. One gives smooth operation indicative of efficient fuel combustion. The other shows a sharp pressure rise, caused by a large amount of fuel entering the cylinders previous to start of ignition.

Hence it will be seen that it is necessary to use a fuel that will burst into flame very quickly after injection is started.

Most engine builders have set a cetane number of 50 as a minimum for good engine operation. Higher cetane numbered fuels are desirable, but here again cost comes into the picture. Cetane numbers for fuels as high as 70 and 75 are in the offing. As better fuels are produced in this range, better diesel performance can be expected.

The sulphur content of fuel oils is a figure that should be watched. The sulphur content should be kept low, not because it affects combustion, but because it may have a disasterous affect on engine parts.

Some of the gases of combustion are bound to get by the piston rings and reach the crankcase. Fuels having a high sulphur content are found to precipitate sulphur tri-oxide into the crankcase. This product of combustion, in the presence of water, becomes sulphuric acid.

There is no need to explain the harmful reaction of sulphuric acid upon valve life and other metallic engine parts.

The exhaust odor alone of high sulphur content fuels is at once discernible and objectionable. The effect of sulphur trioxide on the lubricating oil is exceedingly undesirable. Subjected to contamination with this oxide, the lubricating oil tends to oxidize rapidly. The oil will quickly form a "sludge" that clogs filters and impedes oil flow to the bearings. Lubricating oil so contaminated must be promptly removed from the engine crankcase since its continued use will result in eventual engine failure.

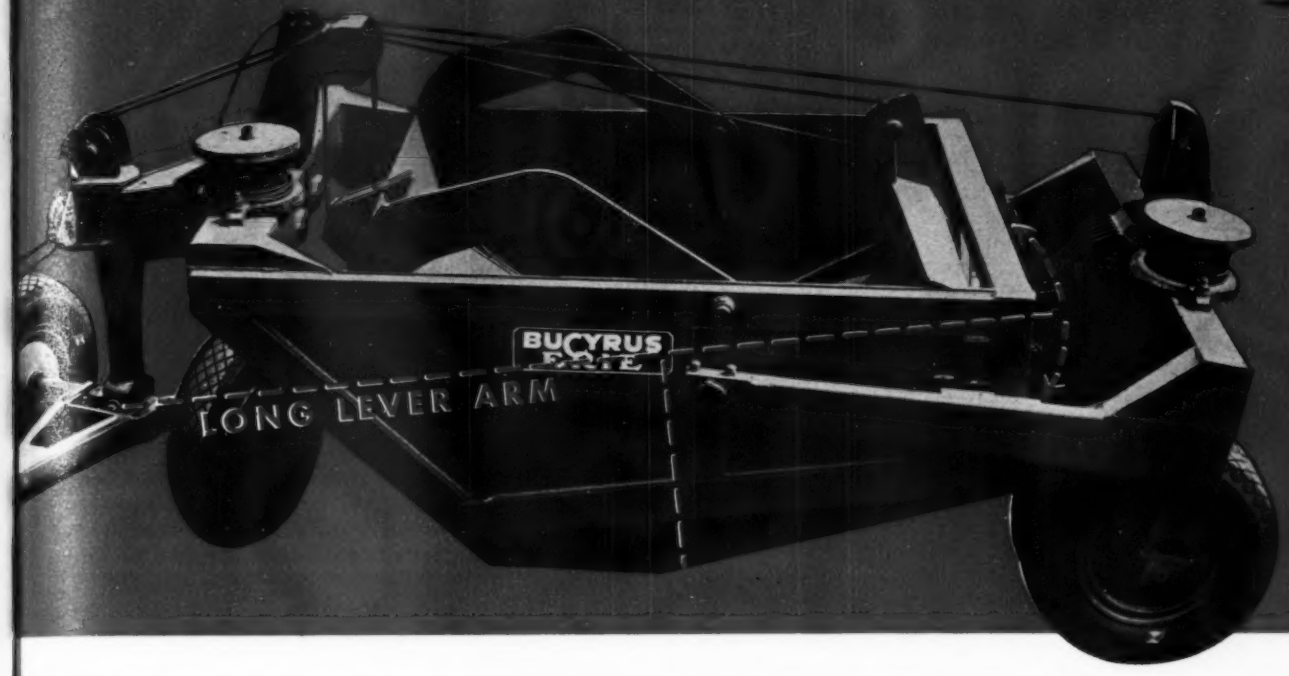
The maximum sulphur content in any fuel must be below .5%. If possible, fuels should be secured that will run well below that figure.

The ash figure is an indication of the presence of mineral matter in the fuel oil. This ash content in a fuel is a carry over from the crude petroleum from which the fuel oil is refined. The better the refining procedure the lower the ash content.

The reason for demanding a low ash content is because of the necessity of eliminating any and all abrasive matter from the fuel. The plunger of the pump delivering the fuel to the combustion chamber is necessarily fitted to 25

*(Continued on page 484)*

# aves on finishing

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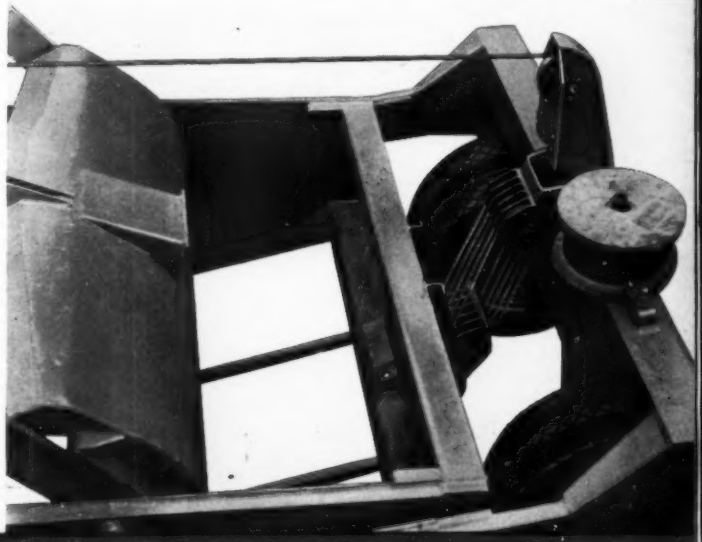
❶ The lever arm extends practically the entire length of the scraper and gives the maximum of control effectiveness. ❷ Ten or twelve-part tackle (depending on size of scraper) gives high-ratio cable control for precision in handling the blade. — For instance, on the 8-yard scraper 16 inches of cable travel at the winch produces only 1 inch of vertical blade movement. ❸ Raising and lowering at the rear produces favorable blade angles for control and tends to eliminate gouging. ❹ Location of the tackle close to the blade level and over the rear wheels also gives a more stable location for blade control. ❺ The control cable leads back without twists or side bends directly from the winch to provide easy responsive action. ❻ The Bucyrus-Erie Power Control Unit provides exceptionally accurate and smooth performance.

You need this Bucyrus-Erie accuracy to meet the requirements for speed on your jobs. It saves you time and money by giving you smooth accurate grades on both cut and fill that reduce (or eliminate) the work you have to do with finishing tools. Bucyrus-Erie Company, South Milwaukee, Wis., U. S. A.



AL TRACTRACTOR DISTRIBUTOR

# Diesel Fuel

*(Continued from page 480)*

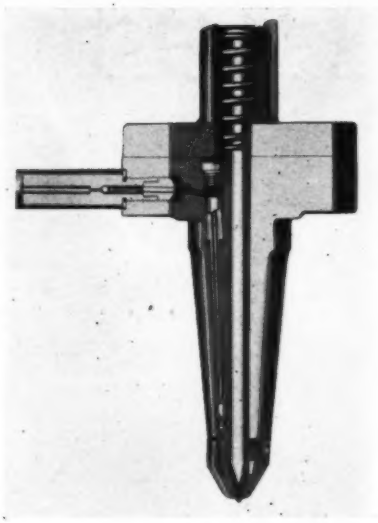
one hundred thousandths of an inch. The slightest scratch or the presence of any grit on this plunger will result in decreasing pump delivery efficiency. Abrasive matter not only means rapid wear of the pump plunger, but also causes wear of the injector nozzle checks. The high velocity of the fuel, as it passes through the injection nozzle, imparts to each particle of abrasive matter an erosive force capable of causing considerable damage. Again, the presence of such abrasive matter tends to distort the injection spray pattern which in turn interferes with proper combustion.

This mineral content of the fuel oil of course is not combustible and consequently remains in the cylinder after the fuel is burned. Here, being abrasive in nature, it tends to cause high cylinder wall and ring wear, neither of which are conducive to long life of engine parts.

Bearing in mind the hazards of using fuels having a high metallic content the figure of .02% maximum should be closely adhered to in the selection of the fuel for the diesel engine.

### Avoid Water and Sediment

Water and sediment should be kept to a maximum of .05% or what is sometimes described as "a trace." Appreciable water content in the fuel is discernible when the fuel has a cloudy appearance.



• Cut-away view of the Cummins diesel injector. The precisely metered fuel charge travels down to the injector tip through the passage on the left. This fuel charge is pre-heated by hot compressed air which is forced into the fuel in the tip on the piston's compression stroke. The pre-heated gasified fuel is then progressively injected into the cylinder by the cam-actuated plunger shown in the center.

Water interferes with combustion. Water causes rusting of fuel tanks and filter bowls. Rust is another form of abrasive material, highly objectionable for two reasons:

1. It will find its way into the injection pump, causing wear which in turn reduces injection pressures.
2. It will cause a high rate of injection nozzle wear.

Proper filters between the fuel oil reservoir and the fuel pump will eliminate rust and water troubles. Nevertheless, fuel oils should not be purchased or used that show more than a .05% water and sediment content.

This figure, appearing in fuel oil specifications, is an indication of the fuel's carbon forming tendencies. After the fuel has been burned in the combustion chamber, we want to be sure that a minimum amount of carbon will be left.

• One of New Mexico State Highway Department's Bucyrus - Erie 20-B is powered by a Caterpillar diesel engine. The machine is loading out base course surfacing for state roads.

Excessive amounts of remaining carbon will tend to clog exhaust valves and exhaust passageways. If by chance the spray pattern is such that the fuel oil hits the cylinder wall opposite the injection nozzle, we want to be sure that layer after layer of carbon is not being built up to interfere with fuel distribution in the cylinder.

The nature of this carbon residue is equally important. Some fuels leave a soft carbon residue, easily blown out on the exhaust stroke. Other fuels may leave a hard carbon, more difficult to remove and at the same time more abrasive.

The carbon residue will vary with the viscosity of the fuel. In other words, heavier oils leave a higher carbon residue than lighter oils.

A safe figure of carbon residue for light oils (31 seconds) is the maximum of .05% whereas in heavier oils (35 seconds) the maximum figure permitted should be .25%.

This figure is the temperature at which the fuel oil ceases to give off a gaseous vapor. We are particularly interested in this since we desire that all the fuel will be burned on the combustion stroke.

When fuel injection stops, a slight amount of unatomized fuel always remains at the nozzle. The amount of fuel left at the nozzle is always greater when combustion temperatures are relatively low. Hence if the fuel oil has an "end point" or final boiling point

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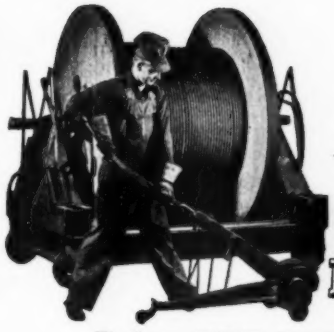

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in excess of 700° F. we can expect this dribble of fuel at the nozzle to remain and "stew" into a carbonaceous deposit. This deposit will tend to deflect and interfere with the formation of proper spray patterns. When such occurs, combustion is effected and smoky exhausts, loss of power and stuck piston rings usually develop.

Here again final boiling points vary with different viscosity fuels. Fuels having a viscosity of 31 seconds should show a maximum final boiling point of 560° F. to 570° F. whereas a 35 second fuel should not have a final boiling point over 700° F.

### Complete Consumption of Fuel

We should like to have all the fuel injected into the combustion chamber completely consumed. We know that temperatures are high enough to ignite material capable of being burned. However, some fuels contain "gums" that are difficult if not impossible to burn at the temperatures available.

Hence we want to be sure the fuel contains little if any gum, for reasons we have previously discussed.

One way of determining the "gum" content of a fuel is by a simple distillation test. If it is possible to recover 98% of the fuel by simple distillation tests we can assume there is not a sufficient gum content to cause trouble.

The recovery figure of the fuel oil to be used should never be below 98%.

We have tried to interpret the specifications of a fuel oil and explain the information they give. We have set limits to which good fuels should conform. With a better understanding of what good fuels can accomplish and, conversely, what harm poor fuels can cause, the diesel owner or operator can more intelligently make his selection from those fuels offered for his use.

But an understanding of fuel oil specifications is not enough. The old "bug-a-boo" that the diesel will burn anything should be thoroughly and effectively squashed. The diesel engine builder is the one to do this. He should take a very definite stand that his diesel engine was developed to produce continuous and low cost power. He should make it clear that this low cost power is not obtained through the use of cheap fuels.

The diesel operator should be made to realize that an unsuitable fuel, even though the cost per gallon is comparatively low, probably results in higher maintenance costs which will more than offset the cost of a better grade fuel.

The oil refiner or supplier of diesel fuel oil should make available proper fuels. The refiner should realize that there is a difference between the fuel requirements of an oil burner used for house heating and today's high speed diesel. He should realize that the diesel engine offers a market for special fuel oil and that with some educational and real selling effort, such fuels can be sold to diesel owners and operators.

It should be remembered that good fuels will pay dividends in higher power output, dependable service and lower costs of engine maintenance.

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Power to dig . . . power to g-r-a-b . . . power to bite out a heaping load—a PAY LOAD—that's Haiss performance. It's built into the bucket. Weight where weight counts. Non-weave rigidity; big-diameter pins, engineered head frame. And counterweight sheaves that are up, out of the dirt. All sizes available. Wire or write for prices. Descriptive Bulletins on request. . . .
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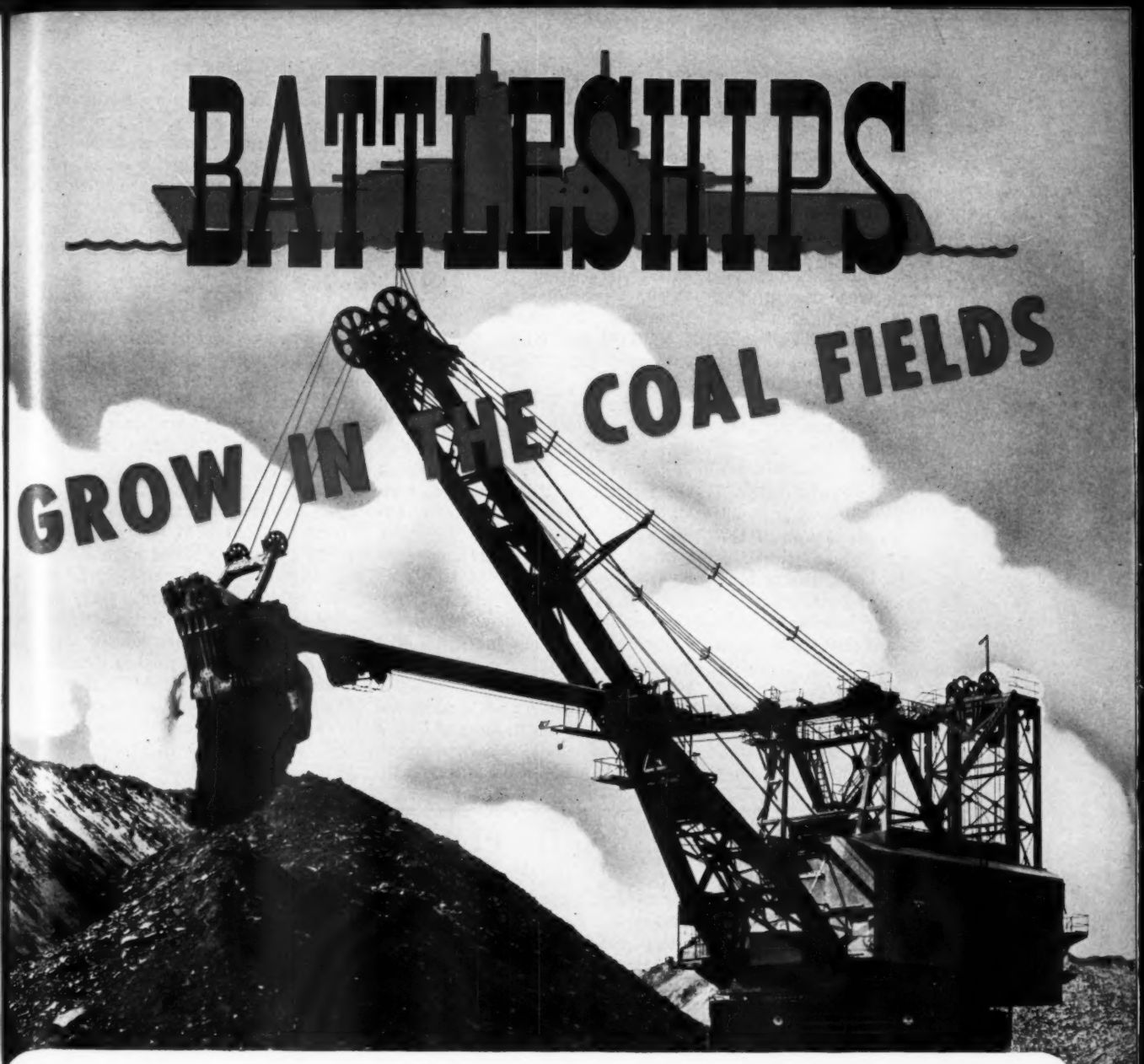
# BATTLESHIPS GROW IN THE COAL FIELDS



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**BUCYRUS ERIE**

V-5

**EXCAVATING, DRILLING AND MATERIAL HANDLING EQUIPMENT**

THE GROUNDWORK OF DEFENSE

# Downtown Job

(Continued from page 459)

Morrison - Knudsen's contract for improving the Los Angeles River channel between 4th Street and Olympic Boulevard faced certain conditions which had to be met and which were not in the least desirable. The channel floor, barely 50 feet wide at the bottom, meant congestion. It meant that Slim DeLong, M-K's superintendent, had to think and scheme and plan his excavations and his concrete pours in that restricted area to the most efficient possible advantage. It meant that he couldn't have any lost motion.

Working on excavation in the heart of the city meant that the material had to be hauled a mile to the Washington Boulevard and Alameda Street dump to be disposed of. It meant that each dump truck hauling the material away added to the congestion. It meant crossing dangerous intersections and railroad tracks with earth hauling equipment. Almost anyone will concede that this isn't exactly a sought-after job condition.

The project included a concrete paved invert in the river channel, with concrete paving on the banks. Banks were sloped 3 horizontal to 1 vertical. Two sewer siphons, at 6th Street and Enterprise Street, were also built under the channel of the river.

A narrow channel, protected with earth dikes on each bank, was thrown up for the diversion of the normal river flow through the job during the process of construction. The water in this channel was shunted over to the other side, on the paved invert, as soon as the concrete on that side was finished.

The 280,000 cubic yards of excavation in the job included gravel, heavy boulders of the half ton size, with broken concrete and other debris. A fleet of 15 assorted dump trucks, mostly 5-yard Fords with Wood hoists, was brought in to haul the excavated material up to the Washington Boulevard dump a mile away. At the start of operations, trucks were loaded with a 2½-yard Northwest shovel, equipped with an Esco dipper. Later on a Bucyrus-Erie 2¼-yard dragline and a Lima 2½-yard dragline, both using Esco buckets were put to use.

The footing in the river channel was more stable than it first appeared to be, and it was not necessary to build mats for the machines to crawl on. There was very little subgrade water to be cared for, but the main problem was to keep that small amount of water out of the way and still find a place in which to work.

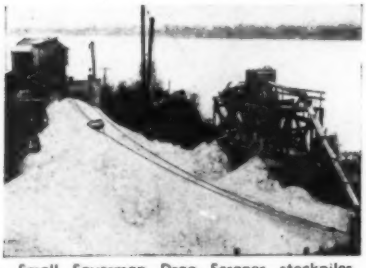
The parts of the job which could be excavated and deposited nearby were removed with a fleet of three Caterpillar D-8 diesel tractors, towing single Wooldridge 20-yard scrapers. These single scrapers were loaded with the aid of a D-8 pusher tractor without rooting the material. Hauling 900 feet, each of these scraper units accounted for about 850 yards of earth per 8-hour shift. Six Firestone 18.00 x 24 Heavy Duty Earthmover tires were used on the Wooldridge scrapers.

### Grading Channel Banks

The banks of the channel were cut down with the regulation units used in excavating, and then bulldozed by a Caterpillar RD-8 bullgrader. The fine grade of the channel slope was set with a surveyor's level. To dress this bank to the close grade set by the surveyors, a D-8 Caterpillar was rigged up with an Emsco reversed 'dozer blade. When the tractor ran up to the top of the slope and backed down, dragging the 'dozer blade lightly over the slope, an excellently finished surface was the result. This method of finishing slopes was quite a contrast to the older, slower method of finishing done by hand with a labor crew.

Each toe of the channel was protected with a 3-foot thickness of concrete, poured monolithically with a small part of the slope paving. Adjoining the toe was an invert slab, which was poured up on one side of the entire job so the river could be routed over it later and the remaining concrete


HANDLE MORE YARDS PER $



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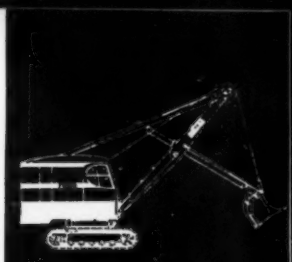

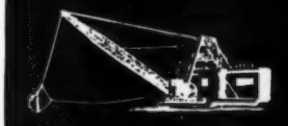
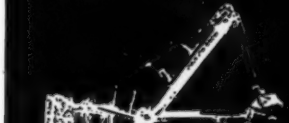

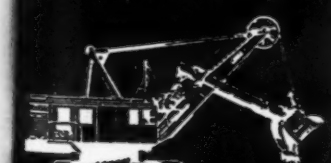
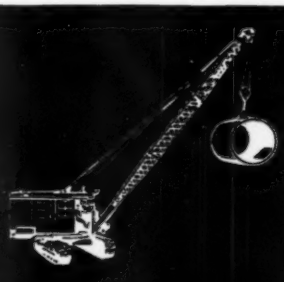
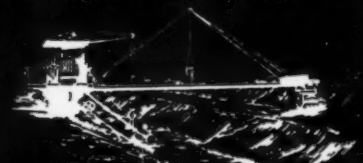

• A load of fine material is scooped aboard one of the 20-yd. Wooldridge scrapers during early excavation operations.

poured on the other side of the channel.

Concrete work was pushed on a 3-shift basis, and 1,000 cubic yards per day was scheduled and poured. Concrete was dry batched at the job batch plant and hauled in batch trucks to the work. A new Rex 34E dual drum paver was used for the bulk of the pours, with a Rex 27E 1-yard paver handy as a standby unit. A 4-inch water line, hooked on to Los Angeles City meters, ran atop the bank over the whole job to furnish the water necessary for mixing the concrete. In general, this Class A concrete was placed with a 2½-inch slump and consolidated with several Ingersoll-Rand vibrators. An Austin-Western 99 motor grader was used to fine grade the invert pours.

The concrete surfaces in the channel invert were finished to steel trowel standards with a Wisconsin mechanical finisher, and then given two coats of clear Hunt Process sealing solution. The channel slopes were rough wood float finished.

The two sewer siphon structures were formed and poured in much the same manner as the rest of the job except that the work site for these two structures was dewatered with a Hercules Model 2XB motor with a Wood 4-inch pump, and a Waukesha 4-inch discharge pump. Water from the pumps was discharged into the river diversion.

The job was handled through the Los Angeles office of the company, which is the nerve center now for all southland construction activities. Lyman D. Wilbur figured the low bid on the job and more recently supervised Morrison-Knudsen's work on Camp Roberts near Paso Robles, California.

## Moving Dirt at a Profit

*(Continued from page 453)*

setting of the concrete piers. The steel gang, however, didn't have a nice warm housing to work in like the men on the concrete work. The only two fellows with comfortable jobs on the bridge were the operators of the Link-Belt Speeder TC-10 truck crane and the Koehring model 503 crane used for steel erection. Both these cranes were gas powered and had 45-foot and 60-foot booms respectively.

• Concrete for the channel invert is poured on reinforcing steel work by a Rex 34-E Duomatic paver.

Other duties of the Link-Belt Speeder crane were the placing of the concrete for the bridge piers and abutments with a 1 yard Blaw-Knox concrete bucket and general hoisting where needed. The Koehring crane was also used for driving sheet piling with a Vulcan No. 2 hammer.

Despite the fact that this job was partly below water level, water was no great problem. Four or five small 2-inch and 3-inch pumps handled all the water there was to get rid of. The reason was that most of the work below water level was done in freezing weather.

Reverting to the fill again, the earth dumped and spread by the 4-wheel scrapers was compacted with the Bucyrus-Erie double-drum tamping roller previously mentioned. The International TD-40 tractor that towed the tamping roller also carried a Bucyrus-Erie bulldozer to handle odds and ends of rough grading. A Caterpillar 30 gas-powered tractor was kept on the job for general utility pushing and hauling.

The International TD-18 tractor which pulled the Bucyrus-Erie scraper was also equipped with a Bucyrus-Erie bullgrader, from which the blade was usually removed while on scraper work. This bullgrader, hydraulically controlled, was found extremely useful because it could do anything that a bulldozer could do when the blade was horizontal, as well as construct slopes and ditches and do plowing with either lower corner when the blade was tilted. Wherever there was room enough and lots of dirt to be

shoved around fast, this unit got the call.

Heavy rolling of the fill was done with one 10-ton and one 12-ton Buffalo-Springfield steam rollers, using soft coal for fuel. These two rollers also had another job during the pouring of the concrete for the bridge supports. They were used as stand-by boilers to supply steam to heat the concrete aggregate.

Four small 1½-yard dump trucks of assorted makes; a 1½-ton Diamond-T pick-up and a 1-ton Ford pick-up constituted the truck fleet on this contract.

Although three 8-hour shifts were worked until after Christmas of 1940 (the night shifts operated under lights produced by the contractor's two portable generator plants), the balance of the job was done on a one-shift-per-8-hour-day basis. All unskilled labor was obtained through the New York State Employment Service at Rochester. Minimum wage for unskilled labor was 55c per hour. Average number of employees was 70.

### Complete Maintenance and Repair Facilities

The contractor was rather self-sufficient so far as maintenance and repairs were concerned, having his own shop on the job, as well as oxy-acetylene and electric welding equipment. Frequent and regular inspection and lubrication was the rule and serious failures of equipment were noteworthy by their absence.

Gulf lubricants, gasoline and diesel oil were used exclusively, delivered to the job in drums for the lube oil and grease.

E. W. Foley, Inc., has had considerable experience handling dirt at a profit. Among this contractor's recent jobs were a $200,000 reinforced concrete highway bridge across the Erie and Pennsylvania railroad tracks (including highway relocation) at Rockville, New York; an $800,000 sewage disposal plant for New York City at Sheepshead Bay, Long Island; and many foundations at the New York World's Fair, among which was the foundation for Billy Rose's Aquacade.

E. W. Foley, Sr., has been in the construction business since 1910. His present firm has offices at 16 Court Street, Brooklyn, N. Y. The officers are: E. W. Foley, president; E. W. Foley, Jr., treasurer; and Frank W. Foley, secretary.

The organization at the Pittsford job consists of Frank W. Foley, general superintendent; Miss Marian Foley, contractor's engineer; James Dempsey, assistant superintendent; Charles Blair, steel engineer; Fred Burke, steel foreman; Tom Olsen, carpenter foreman; and Miss Alice Foley, timekeeper.

Responsible officials for the State of New York are Arthur W. Brandt, superintendent of public works; T. F. Farrell, chief engineer, division of engineering; H. O. Schermerhorn, commissioner of highways; Edward W. Wendell, assistant chief engineer; Guy Pinck, commissioner of canals; E. C. Lawton, district engineer; and Sidney Towe, engineer in charge of the job for the state of New York.

We especially recommend the Preformed type of "HERCULES" (Red-Strand) Wire Rope for use on backfillers, bulldozers, carryall scrapers, clamshells, conveyors, cranes, draglines, dredges, hoists, shovels, skimmers and trench hoes.

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When you buy Preformed "HERCULES" (Red-Strand) Wire Rope, you get a Preformed wire rope of the very highest quality — not only as to quality of material, but fabrication as well. As it is furnished in both Round Strand and Flattened Strand construction, there is a right rope for every heavy duty purpose.

Why not take advantage of the time and money saving possibilities of Preformed "HERCULES"? Try it, then compare its performance record with that of any other rope you have ever used.

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# *Notes* from the manufacturers

**The Falk Corporation,** Milwaukee, Wisconsin, announces the appointment of W. L. Schneider to the position of vice president of sales, T. F. Scannell to sales manager, and J. B. Kelley to assistant sales manager.

**Worthington Pump and Machinery Corporation,** Harrison, New Jersey, recently announced the appointment of R. M. Cleveland, a veteran of twenty-four years service with the organization, as manager of its Boston office. He succeeds W. A. Finn who has been called to active duty with the Navy in the rank of lieutenant. Mr. Finn had been with Worthington since resigning his commission as a Naval officer in 1926.

**Iron & Steel Products, Inc.,** Chicago, Illinois, dealers in anything containing iron or steel, has appointed Paul G. Cheatham, Jr., of F. I. Madero, No. 55, Mexico, D. F., as their representative for Mexico to succeed Sr. P. C. Morales who has resumed his old position, which he resigned in 1935, as general superintendent of motive power and machinery of the National Railways of Mexico at President Camacho's request.

**The Timken Roller Bearing Company,** Canton, Ohio, has appointed C. M. Maratta as chief works engineer to fill the vacancy left through the death of W. C. Makley. Mr. Maratta served as power plant inspector of the Pennsylvania Railroad for seven years, draftsman for Westinghouse Electric for four years, and joined Timken as a draftsman in 1917. It has also been announced that Harry McCool, Jr., has been appointed Southwestern sales representative for the Steel and Tube division. His territory includes Kansas, Louisiana, Oklahoma, Arkansas and Texas with headquarters at Dallas.

**Elastic Stop Nut Corporation,** 2332 Vauxhall Road, Union, New Jersey, has doubled the floor space of its plant at Union, New Jersey. The original building was erected in 1940 by The Austin Company, and has attracted considerable attention by virtue of the fact that all of its steel construction is fastened with bolts and Elastic stop nuts, instead of rivets.

**Jones & Laughlin Steel Corporation,** Pittsburgh, Pennsylvania, has authorized an extension to its present wire rope plant at Muncy, Pennsylvania, and the installation of additional equipment. It is expected that work will be started this week on a 120x275 foot addition to the plant to house a new closing machine which fabricates the strand into finished rope, and to provide warehouse space. A new office building is also being constructed on the property.

**The Ransome Concrete Machinery Company,** Dunellen, New Jersey, has appointed The State Tractor & Equipment Company, 815 East Jefferson Street, Phoenix, Arizona, as their exclusive distributor in the State of Arizona to handle their complete line of construction equipment.

**Gar Wood Industries, Inc.,** Detroit, Michigan, has appointed The Standard Truck Equipment Company, 861 South State Street, Jackson, Mississippi, authorized distributor for the hoist and body division according to a recent announcement by W. H. Hammond, sales manager.

**Morris Machine Works,** Baldwinsville, New York, manufacturers of centrifugal pumps, hydraulic dredges and steam engines, announces the appointment of L. J. Lynch as their new representative in the Detroit district. Mr. Lynch is located at 403 Kales Building.


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Tremendous Development Facilities *work* the year around *perfecting BETTER* and *BETTER* Materials.

*Whatever* your service, *we have what it takes* to do the job BETTER and *will* guarantee results.

GATKE Moulded Fabric BEARINGS do the Impossible Write for Facts

Just *tell* us what you need.

Woven Brake Lining

GATKE CORPORATION
212 N. LaSalle St., Chicago

Asbestos Clutch Facings for ALL requirements.

Asbestos Clutch Facings with integrally moulded teeth.




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# POSITIONS WANTED

**Positions wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00. Advertisements for help wanted free of charge.**

**Address all box numbers c/o EXCAVATING ENGINEER . . . . . at South Milwaukee, Wisconsin**

**ALL-AROUND OPERATOR**

Can operate any kind of machine, large or small. Have had experience in quarry, ore and coal stripping. Familiar with grading work. Operate steam, diesel, gas or electric. Can do own repair work. Would like steady work in coal or ore fields. References. Box 9170

**MASTER MECHANIC**

Fully experienced Master Mechanic. Can take complete charge of diesel, electric or gas draglines or shovels. References. Box 9171

**OPERATOR**

Fully experienced shovel operator—electric, gas or steam power. Familiar with back hoe work. Can do erection and repairing. Will go anywhere. Box 9169

**EXCAVATING EXECUTIVE**

With 19 years' engineering and managerial experience covering road building, quarrying, dredging and general construction. Desires connection with active outfit that can make good use of a man with practical experience in handling men and machines. For full information write Box 9168

**OPERATOR**

Experienced in construction, levee, roadbuilding and stripping. Prefer work on large draglines or cranes. Have operated electric, diesel, gas and steam models. Can do own repair work. Married. Will go anywhere. A-1 references. Box 9172

**HELP WANTED**

Want an experienced Lima operator for coal stripping job in Illinois. Also experienced coal loader operator for Lorain shovel. Box 9173

# *New* trade literature

Title: **"Mining Engineers' Handbook"**

Subject: Progressive modification of mining methods and appliances and development of new methods prompted the revising and enlarging of this edition which has been published in two volumes. Much new matter has been added, some of the older text omitted, and some sections almost entirely rewritten and re-illustrated.

Where to Get: John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price, $15.00.

Title: **"14-S Mixers"**

Subject: A new eight page, two color bulletin, with large illustrations and complete detail features of 14-S mixers.

Where to Get: The Ransome Concrete Machinery Company, Dunellen, New Jersey. Free upon request, ask for bulletin No. 177.

Title: **"Lessons in Welding"**

Subject: A series of 60 lessons which present, in concise manner, fundamental facts of welding, knowledge of which will enable the welder to utilize the process successfully and economically. A set of questions and answers for each lesson enables the student to check his knowledge. By-line drawings and photos supplement text explanation.

Where to Get: The Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio. Price, 50 cents per copy, postpaid anywhere in U. S. A., 75 cents elsewhere.

Title: **"20th Proceedings of the Highway Research Board"**

Subject: Thorough analysis reports covering finance, economics, design, material and construction, maintenance, traffic and safety. Also of interest are the minutes of the business meeting, memorials, highway research and Bartlett awards and many other features. This year's volume contains 883 pages or an increase of 50% over last year's.

Where to Get: Highway Research Board, National Research Council, 2101 Constitution Avenue, Washington, D. C. Price, $3.25.

Title: **"Modern Brake Blocks and Frictions"**

Subject: This large, illustrated brochure, comprehensively pictures numerous modern type of Gatke friction materials for all requirements of excavating, road building, and construction equipment, as well as trucks, tractors, trailers, etc. Large or small —standard or special—this informative brochure shows Gatke brake lining, clutch facings, and swing frictions for all applications.

Where to Get: Gatke Corporation, 228 North LaSalle Street, Chicago, Ill. Free upon request.

Title: **"The Fleet Operators Cleaning Handbook"**

Subject: The handbook thoroughly describes and discusses in detail cleaning methods and materials for use in the maintenance of vehicles, garages, terminals, etc. It is written for all those persons concerned with safer, more efficient and economical operation of fleet equipment. Profusely illustrated with photographs of actual cleaning operations.

Where to Get: Magnus Chemical Company, Inc., Dept. F., Garwood, New Jersey. Free upon request.

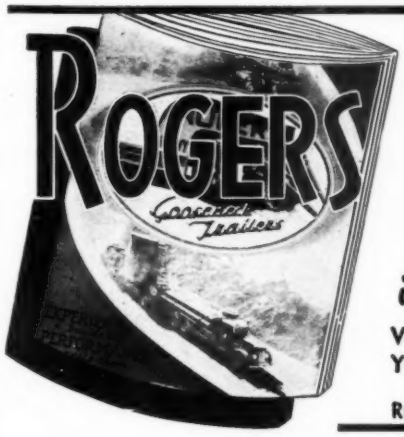
Title: **"Two-In-One Tape"**

Subject: The use of the tape in various services, as well as methods of application which can readily be followed is described thoroughly.

Where to Get: The B. F. Goodrich Company, Akron, Ohio. Free upon request.

Title: **"The History, Purpose and Practice of Metallizing"**

Subject: With the help of many operation pictures, this 52 page book thor-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oughly describes the application of the metallizing process on a variety of jobs. Answering of many questions, relative to the use of this process, testimonial letters from users, job reports and records and illustrations of the different field men and the territory they serve are a few of the features.

Where to Get: Metallizing Company of America, Inc., 562 West Washington Boulevard, Chicago, Illinois. Free upon request.

Title: **"Gooseneck Trailers"**

Subject: Comprehensive, twenty-eight page catalog devoted entirely to heavy duty trailers. Manufacturing experience in this field, essential and common features of all models are thoroughly dealt with. All sizes are illustrated and specifications of each are given. Many actual operating shots are also included.

Where to Get: Rogers Brothers Corporation, Albion, Pennsylvania. Free upon request.

Title: **"Simplex Jacks"**

Subject: Jacks in innumerable types to multiply man-power, to relieve busy cranes and other handling equipment and to simplify many jobs now "being done the hard way" are shown in this new catalog. Recently revised price schedules are also given along with other data.

Where to Get: Templeton, Kenly & Company, Chicago, Illinois. Free upon request, ask for catalog 41.

Title: **"Some Effects of Abalyn and Hercolyn on the Properties of Blown Asphalt"**

Subject: Contains tables on the fluidity of asphalt, its rate of penetration into asbestos and felt, and the changes in viscosity, flexibility, impact resistance, penetration values, and susceptibility factors brought about by additions of the esters. Experimental data indicating the changes brought about in asphalt used in the manufacture of shingles, felt-base roofing, tar paper, insulating board, asbestos and cellulose board, felt-base linoleum and mastic tile and in road construction are included.

Where to Get: Hercules Powder Company, Wilmington, Delaware. Free upon request.

Title: **"Portable Substations"**

Subject: Portable substations to meet the current demand for emergency power are described in this new 8-page booklet. Units with voltage ratings up to 69 kv and capacities up to 4,500 kva are discussed. The various parts that make up a portable substation are pointed out with arrows on opposite side views of the same unit. Special core and heat exchanger features and "forced-flow" cooling are described with a note on automatic protection.

Where to Get: Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pennsylvania. Free upon request, ask for booklet B-2281.

Title: **"Power Shovel Dipper and Dipper Parts"**

Subject: Approximately forty-two illustrations of different shovel dippers. Latest designs of the renewable lip dipper, large dredging and coal stripping dippers, light weight special dipper and one-piece buckets are discussed. Eight pages are devoted to dipper teeth and other parts. Twenty-five questions and answers to the query "What is manganese steel?" Two page spread showing Amsco plant facilities.

Where to Get: American Manganese Steel Division of the American Brake Shoe & Foundry Company, Chicago Heights, Illinois. Free upon request.

## BARGAINS IN USED EQUIPMENT

FOR SALE, RENTALS, BUSINESS OPPORTUNITIES, TRADES, ETC.

**To the reader wishing to advertise used equipment in the "For Sale" Section:** All advertising in this section is payable in advance. Enclose your check or money order with copy. Rate: 60c per line. Minimum charge $2.40. No discounts; no commissions. If no change in copy is desired, three continuous insertions are offered for the price of two. Read these instructions carefully. Each line contains 41 characters (34 characters if all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number, if blind advertisement is desired. Count your own copy to save delay. Holding up your advertisement one month to secure approval of revised copy or an additional remittance may cost you real money in a lost sale. Be sure to enclose the correct amount of money with your order. Closing date—15th of preceding month. Example: January issue closes December 15th.

**To the reader wishing to answer "For Sale" Section advertisements appearing on these pages:** Be sure to address your inquiry to the advertiser by using the correct box number. Mail your letter in care of Excavating Engineer, South Milwaukee, Wisconsin. Write each advertiser a separate letter. Do not write us for name and address of advertiser. This information will not be given out. We have no information about the equipment advertised other than that shown in the advertisements themselves.

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*Up to 2½ Cubic Yards*

**BUCYRUS-ERIE GA-2** High Lift 1 yd. Shovel. Waukesha WS engine. Single Shaft Cats. Operating condition. Located eastern Pennsylvania. Box 2776

**BUCYRUS-ERIE GA-2** Gas-Air high lift shovel. 24' boom. 18'4" dipper handle. 1¼ yd. dipper. Waukesha 6¼"x8" 4-cylinder engine. Electric starter. Quantity spare parts included. Excellent condition. Located Eastern Pennsylvania. Box 2774

**NORTHWEST MODEL 105** gasoline caterpillar mounted Shovel. Re-built with late design cats and boom. Good operating condition. Located Washington. Box 2762

**SHOVEL**
**2 YARD DIESEL**
Immediate Shipment
Practically New
H. KLEINHANS COMPANY
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**P&H MODEL 206,** ¾-yd. shovel in good operating condition, or will trade for ⅝ or ½-yd. crane, truck or crawler mounted. Paul Borchardt, Highland Park, Illinois.

**LORAIN 40** with one purpose trailer. Two years old. ¾-yd. Shovel and backhoe attachments. In tip top working order. Located Indiana. Box 2779

**BUCYRUS-MONIGHAN MODEL 2-W** Diesel dragline. 70' boom. 1 2½-yard Page drag bucket. 1 2½-yard Bucyrus-Erie drag bucket. Engine overhauled March 1941. Excellent condition. Located Southern Illinois. Box 2780

**Dragline-Crane For Rent**
**READY TO WORK.** K44 Link-Belt crawler dragline-crane. 55' boom, 1¾-yd. drag bucket. Crane capacity 25 tons at 12'. Light Plant. Located Iowa. Box 2798

**BUCYRUS-ERIE MODEL 1030.** Gasoline. Clamshell. 50 ft. Boom. ¾-yard Owen Digging Bucket. Also Draghovel equipment. Good operating condition. Working every day. Located Detroit. Box 2768

**LORAIN MODEL 60** 1 yd. Gas Shovel. Waukesha engine. Machine generally overhauled few months past. Operating condition. Located Minnesota. Box 2743

**BUCYRUS-ERIE 46-B** with 1½-yd. bucket and 2½-yd. bucket, Kohler light plant, 75 ft. boom, 6-cylinder Buda diesel engine with electric starter. Located Southeast Missouri. Box 2788

**BUCYRUS-ERIE 55-B** Diesel Dragline. 75'-0" Boom. Oversize Cats. Atlas engine. Now operating Kansas. Box 2766

**AMERICAN MODEL G.S.** 1-yard Gas Clamshell. 50 ft. Boom. Waukesha Engine. Good condition and appearance. Located Detroit. Box 2770

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No. 3756 — Model 221
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CLASS C PAGE BUCKET
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